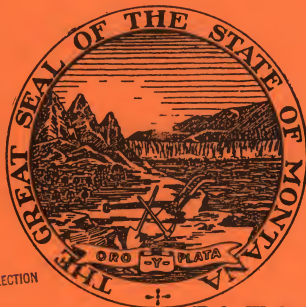


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STANDARD DRAWINGS

1979 EDITION



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SUPPLEMENTAL

TO

STANDARD SPECIFICATIONS

FOR

ROAD AND BRIDGE CONSTRUCTION

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STANDARD DRAWINGS FOR HIGHWAY CONSTRUCTION

These Standard Drawings which are supplementary to the Standard Specifications become effective June 1, 1979.

In the future when revised drawings are sent, they will become effective on the date shown thereon and the superseded drawings should be retained until no longer applicable.

New drawings issued will become effective on the date shown thereon.

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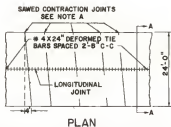
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SYMBOLS & ABBREVIATIONS

TITLE SHEET		PLAN		PLAN		PLAN		PLAN	
	PRIMARY ROAD*		STATE & NATIONAL LINE		OIL OR GAS WELL		DROP INLET		POINT OF INTERSECTION
	PRIMITIVE ROAD		CITY OR TOWN BOUNDARY		TANK		DRAIN		PLACE
	PROPOSED ROAD		SECTION LINE (showing corner only if found—open if not found)		HYDRANT (show as to type or service)		EAST		PLANT
	GRAVELED ROAD		HIGHWAY RIGHT-OF-WAY		WATER WELL		EASTWARD		POINT ON CURVE
	FEDERAL AID ROUTE (On Existing Road)		BASE OR SURVEY LINE		BOULDER		ELEVATION		POINT ON TANGENT
	FEDERAL AID ROUTE (New-Existing Road)		RETAINING WALL		EMULSION		EQUALIZED		POWER POLE
	INTERCHANGE		RAMP		E.O.		ISSUE OF OIL		PRESTRESSED
	STRUCTURE		CONCRETE SIDEWALK		EQUATION		EASTWARD		PROJECTOR
	FREE FERRY		CONCRETE CURB		EXHAUST		EXCAVATION		POINT OF TANGENT (End of Curve)
	TOLL FERRY		PRICE LINE		STATION MARKER		EXTENSION OF EXTERNAL		P.T.
	HIGHWAY TUNNEL		CATTLE GUARD		PROPERTY LINE		FEDERAL AID		POWER (LINE)
	PASS		SNOW FENCE		NORTH ARROW		FENCE		NEAR DISTANCE (HORIZONTAL)
	RAILROAD		TREE OR BUSH		DEFLECTION ANGLE		FERTILE		RANGE, CURVE RADIUS, RISE
	RESERVATION LINE		SMALL ORNAMENT		DEFLECTION ANGLE (Curve)		FLOW LINE		R.C.
	STATE & NATIONAL LINE		SLUICE OR CLIFFS		PROPERTY LINE		ROADWAY		REINFORCED CONCRETE PIPE
	COUNTY LINE		GRAVEL PIT		DITCH		REINFORCEMENT		RIGHT OF WAY
	TOWNSHIP & SECTION LINE		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
	U.S. HIGHWAY		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
	CITY OR TOWN		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
	AIR FIELD		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
	DAM		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
	BUILDING		GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
Primary roads are DB inch wide. All others are DB inch wide.			GRAVEL PIT		GRAVEL PIT		RIGHT OF WAY		ROUTE
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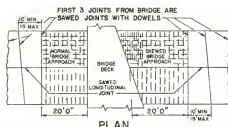


8" X 24' PLAIN P.C. CONCRETE PAVEMENT



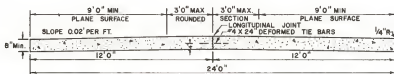
NOTE A. CONTRACTION JOINTS SHALL BE SAWED DIAGONALLY AS SHOWN ABOVE UNLESS SHOWN OTHERWISE ON THE PLANS.
 OFFSET = 4' IN 24' AND SKEWED COUNTERCLOCKWISE TO THE DIRECTION OF TRAFFIC MOVEMENT.
 SPACING OF THE JOINTS SHALL BE 13', 15', 18', 20' AND REPEAT EXCEPT FOR THE FIRST JOINT AT BRIDGE APPROACH PANELS OR EXPANSION JOINT LAYOUT

NOTE C. CONTRACTION JOINTS SHALL BE CONSTRUCTED AT LEAST 6' FROM ANY CONSTRUCTION JOINT (STD. DWS. #77)



NOTE B. THE 10' MIN AND 19' MAX DIMENSIONS SHOWN ABOVE ARE ALSO APPLICABLE FOR THE FIRST CONTRACTION JOINT ON EITHER SIDE OF AND EXPANSION JOINT LAYOUT.

SAWED JOINT DETAIL FOR BRIDGE APPROACH PANELS



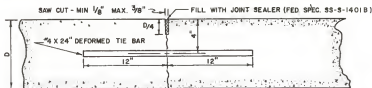
SECTION A-A

FOR CONTRACTION JOINT DETAIL

FOR LOCATION AND DETAILS OF DOWELED CONTRACTION JOINTS

DEFORMED TIE BARS TO BE INCLUDED IN UNIT PRICE BID FOR P.C. CONCRETE PAVEMENT.

SAWED LONGITUDINAL JOINT WITH DEFORMED TIE BARS



MAXIMUM SPACING OF TIE BARS 2'6" C-C

TIE BARS MAY BE INSTALLED AFTER THE CONCRETE HAS BEEN STRUCK OFF AND PRIOR TO FINAL FINISHING, BY AN INSTALLING DEVICE, PREVIOUSLY APPROVED BY THE ENGINEER, WHICH WILL PLACE THE TIE BARS IN THE REQUIRED POSITIONS AND LOCATION.

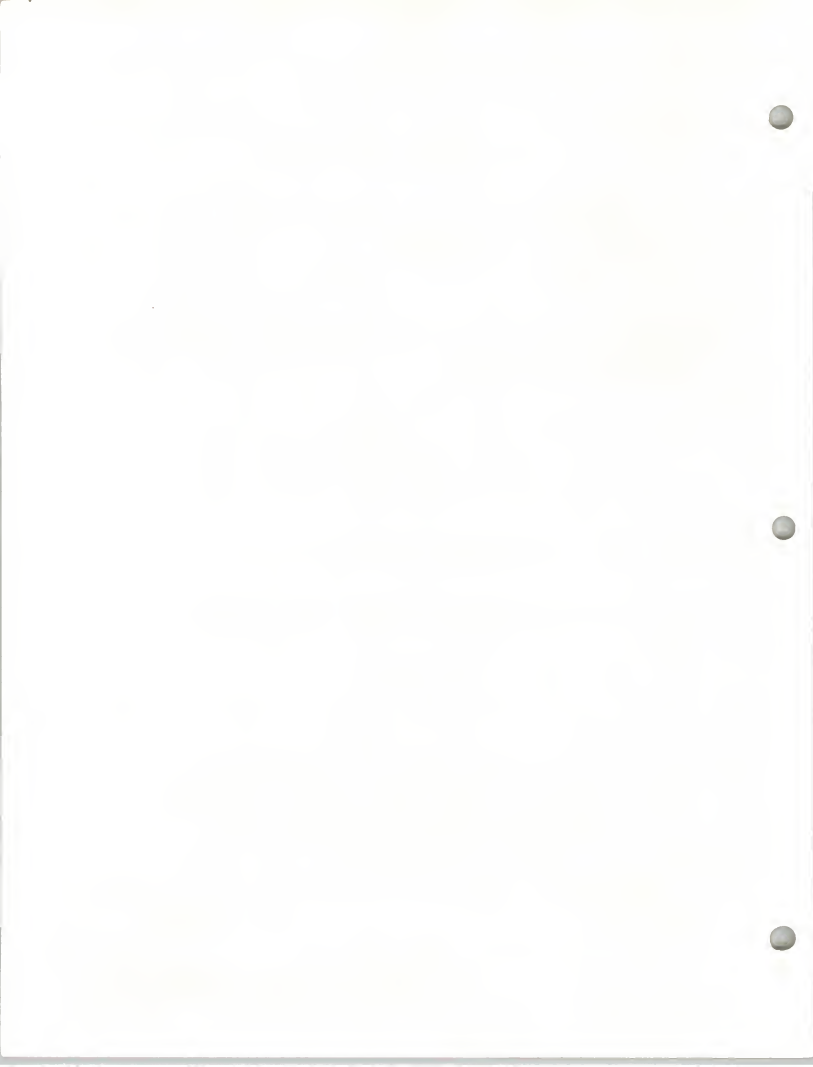
TIE BARS PLACED IN ADVANCE OF CONCRETE PLACING OPERATIONS SHALL BE RIGIDLY AND SECURELY SUPPORTED IN THE REQUIRED POSITION AT THE JOINT BY CHAIRS, STAKES AND OR SUPPORTING DEVICES. THE SUPPORTING DEVICES MAY BE FACTORY ASSEMBLED. THE CONTRACTOR SHALL FURNISH THE ENGINEER WITH DETAIL DRAWING OF THESE DEVICES, A SUFFICIENT TIME IN ADVANCE OF CONSTRUCTION, FOR HIS APPROVAL. ANY APPROVAL OF DRAWINGS OF THESE DEVICES SHALL BE CONSIDERED TENTATIVE AND FINAL APPROVAL SHALL BE CONTINGENT UPON THEIR SATISFACTORY PERFORMANCE.

SEE STANDARD SPECIFICATIONS ARTICLE 39.04 (K) (4) FOR SAWED JOINT.

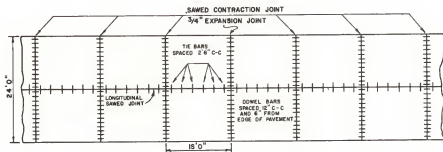
THE COST OF THE TIE BARS, JOINT SEALER, AND SUPPORTING DEVICES SHALL BE INCLUDED IN THE UNIT PRICE BID PER SQUARE YARD OF P.C. CONCRETE PAVEMENT.

NOTE THIS JOINT MAY BE USED AT OTHER LOCATIONS IF CALLED FOR ON THE PLANS.

STANDARD DRAWING		
REFERENCE	DWG. NO.	
STANDARD SPEC.	15	
SECTION 39		
P.C. CONCRETE PAVEMENT		
SAWED JOINTS WITH TIE BARS		
REVISED	12/20/74	4/1/79
EFFECTIVE	3/1/72	2/1/75 6/1/79
APPROVED BY <i>John R. B. Smith</i>		
ADMINISTRATOR-ENGINEERING DIVISION		

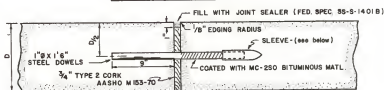


EXPANSION JOINT LAYOUT



3/4" EXPANSION JOINT TO BE FILLED WITH TYPE 2 CORK AND JOINT SEALER. SMOOTH STEEL DOWELS WITH SLEEVES AT EXPANSION JOINT. SMOOTH STEEL DOWEL WITHOUT SLEEVES STD DWG NO 17 COATED WITH MC-250 BITUMINOUS MATERIAL FOR ONE-HALF THE LENGTH OF THE DOWEL, INSTALLED IN SAWED CONTRACTION JOINT, THE FIRST THREE CONTRACTION JOINTS EACH SIDE OF EXPANSION JOINT.

EXPANSION JOINT



DOWELS SPACED 12" C-C BEGINNING 6" FROM OUTER EDGES OF PAVEMENT.

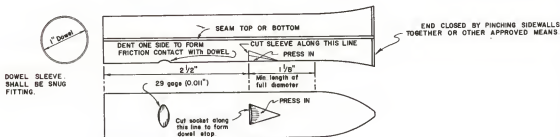
DOWELS TO BE PROVIDED WITH DOWEL SLEEVES

ONE-HALF THE LENGTH OF THE DOWEL ON WHICH THE SLEEVE IS PLACED SHALL BE THOROUGHLY COATED WITH MC-250 BITUMINOUS MATERIAL OR HEAVY GREASE. SLEEVES TO BE PLACED ON ALTERNATE ENDS OF DOWEL BARS.

THE TYPE 2 CORK EXPANSION JOINT FILLER, AASHO M 153-70 SHALL CONFORM TO THE DIMENSIONS SHOWN AND CUT TO FIT THE CROWN AND SUBGRADE.

THE CONTRACTOR SHALL FURNISH CHAIRS, STAKES, AND/OR SUPPORTING DEVICES CAPABLE OF HOLDING THE DOWELS AND JOINT FILLER SECURELY AND RIGIDLY IN THEIR REQUIRED POSITIONS. THE DOWEL AND JOINT FILLER SUPPORTING DEVICES MAY BE FACTORY ASSEMBLED. THE CONTRACTOR SHALL FURNISH THE ENGINEER WITH DETAIL DRAWINGS OF THESE DEVICES, A SUFFICIENT TIME IN ADVANCE OF CONSTRUCTION, FOR HIS APPROVAL. ANY APPROVAL OF DRAWINGS OF THESE DEVICES SHALL BE CONSIDERED TENTATIVE AND FINAL APPROVAL SHALL BE CONTINGENT UPON THEIR SATISFACTORY PERFORMANCE.

DOWEL SLEEVE FOR 1" DOWEL BARS



SLEEVES TO BE PLACED ON ALTERNATE OPPOSITE ENDS OF DOWELS. HALF THE LENGTH OF THE DOWEL, ON THE END ON WHICH THE SLEEVE IS PLACED, SHALL BE THOROUGHLY COATED WITH MC-250 BITUMINOUS MATERIAL OR HEAVY GREASE TO BREAK THE BOND.

DOWELS, DOWEL SLEEVES, JOINT FILLER MC-250 AND SEALER, TOGETHER WITH THE SUPPORTING DEVICES NECESSARY FOR THE PROPER INSTALLATION OF THE JOINT, SHALL BE INCLUDED IN THE UNIT PRICE BID PER SQUARE YARD FOR P.C. CONCRETE PAVEMENT.

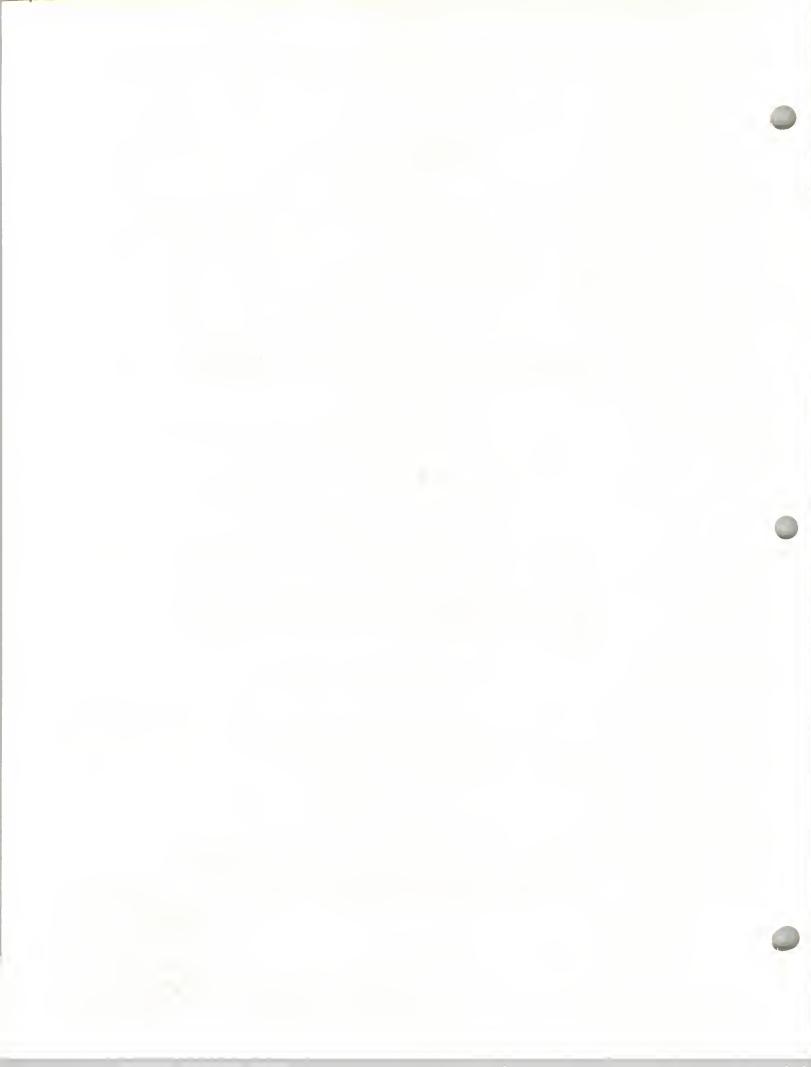
STANDARD DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC.	16
SECTION 59	

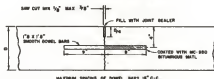
P.C. CONCRETE PAVEMENT
EXPANSION JOINTS & DOWEL SLEEVES

APPROVED	BY <i>John P. Burt</i>
ADMINISTRATOR-ENGINEERING DIVISION	

REVISED	4/1/79
EFFECTIVE	3/1/72



SAWED JOINT WITH DOWEL BARS

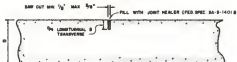


ONE-HALF LENGTH OF THE DOWEL BARS ON ALTERNATE ENDS SHALL BE THOROUGHLY COATED WITH MC-200 WATERBORNE EPOXY, TO HEAVY BRUSH.

THE CONTRACTOR SHALL FURNISH CHAIRS, STAYS AND/OR SUPPORTING DEVICES CAPABLE OF HOLDING THE DOWELS AWAY FROM THE SLAB, AT THE REQUIRED POSITION. THE CHAIRS SUPPORTING DEVICES MAY BE REMOVED AFTER THE CONTRACTOR SHALL FINISH THE JOINTS WITH METAL COATING OF THESE DEVICES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE FOR THE REMOVAL OF CHAIRS AND/OR SUPPORTING DEVICES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF CHAIRS AND/OR SUPPORTING DEVICES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF CHAIRS AND/OR SUPPORTING DEVICES.

DOWEL BARS MAY BE PLACED BY MECHANICAL EQUIPMENT IF APPROVED BY THE ENGINEER.

SAWED CONTRACTION JOINT

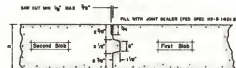


SEE STANDARD SPECIFICATION, ARTICLE 30.04(1)(4) FOR SAWED CONTRACTION JOINT DETAILS.

WHERE INTERNAL CURB IS CALLED FOR, THE JOINT SHALL BE CONTINUED THROUGH THE INTERNAL CURB.

THE JOINT OF JOINT HEALER JOINTS, BARS, SUPPORTING DEVICES AND CONSTRUCTION JOINTS SHALL BE INCLUDED IN THE UNIT PRICE PER SQUARE YARD OF P.C. CONCRETE PAVEMENT.

LONGITUDINAL KEYWAY JOINT



KEYWAY JOINT (1.10\"/>

LONGITUDINAL KEYWAY JOINT WITH THE BARS



MAXIMUM SPACING OF THE BARS 8\"/>

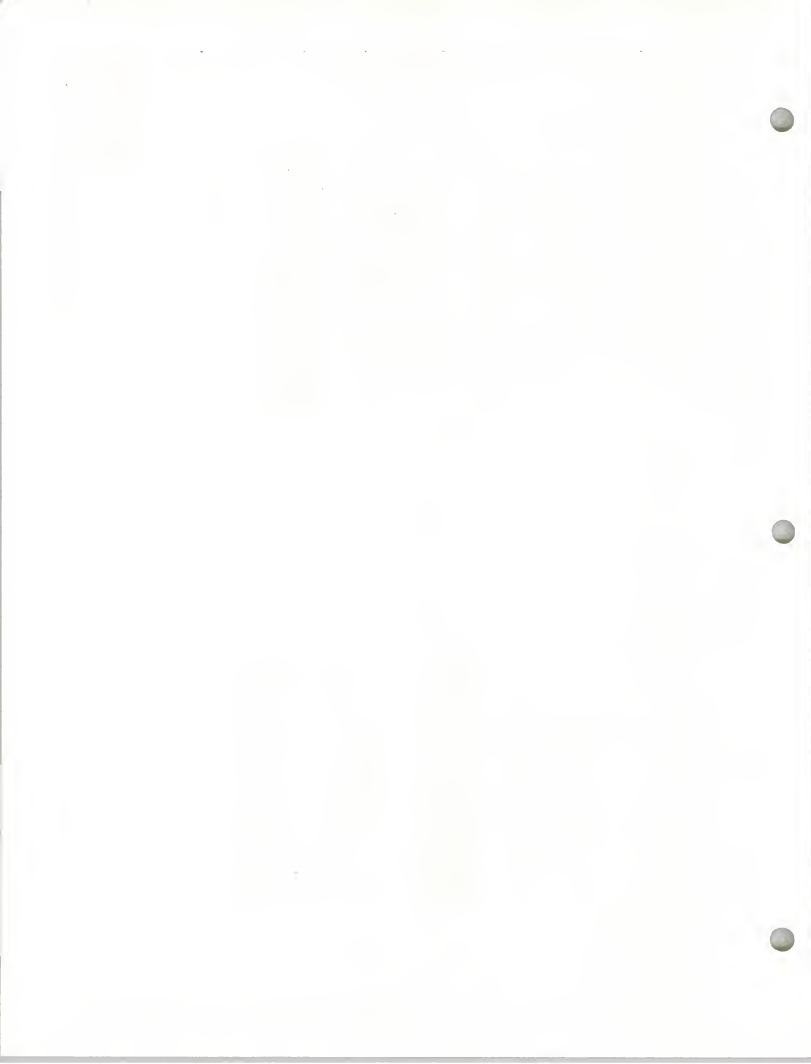
LONGITUDINAL KEYWAY JOINTS SHALL BE USED WHEN PAVEMENT IS CONSTRUCTED IN SINGLE ALTERNATE LANE AND WITH REINFORCING TO BARS SUCH CALLS FOR ON THE PLANS.

DETERMINED TO BARS SHALL BE SURELY AND SECURELY SUPPORTED IN THE REQUIRED POSITION AT THE JOINT. CHAIRS, STAYS AND/OR SUPPORTING DEVICES CAPABLE OF HOLDING THE BARS AWAY FROM THE SLAB, AT THE REQUIRED POSITION. THE CHAIRS SUPPORTING DEVICES MAY BE REMOVED AFTER THE CONTRACTOR SHALL FINISH THE JOINTS WITH METAL COATING OF THESE DEVICES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE FOR THE REMOVAL OF CHAIRS AND/OR SUPPORTING DEVICES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF CHAIRS AND/OR SUPPORTING DEVICES.

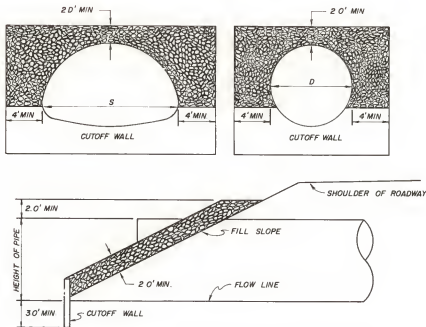
REINFORCING THE BARS, JOINT MATERIALS AND SUPPORTING DEVICES ARE TO BE INCLUDED IN THE UNIT PRICE PER SQUARE YARD FOR P.C. CONCRETE PAVEMENT.

IN DETAIL FOR TRANSVERSE CONSTRUCTION JOINTS.

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC:	17
SECTION:	48
P.C. CONCRETE PAVEMENT	
SAWED AND KEYWAY JOINTS	
REVISED	4/2/79
EFFECTIVE	3/1/79
DESIGNED BY	LD/LL
CHECKED BY	LD/LL
APPROVED BY	LD/LL

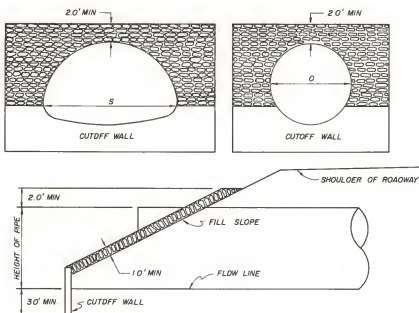


RANDOM RIPRAP



SEE SPECIFICATIONS FOR GRADATION, TYPES AND CONSTRUCTION METHODS.

HAND LAID RIPRAP



ENDS OF RIPRAP WALLS SHALL BE KEYED INTO THE EMBANKMENT SLOPES A MINIMUM OF 2 FEET FROM OUTER FACE OF THE RIPRAP FOR THE FULL HEIGHT OF THE RIPRAP WALL.

SEE SPECIFICATION FOR GRADATION AND CONSTRUCTION METHOD.

STANDARD DRAWING

REFERENCE	DWG. NO.
STANDARD SPEC.	25
SECTION 50	

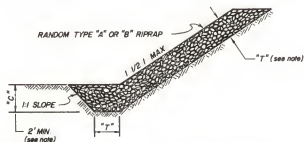
CULVERT RIPRAP

REVISED	EFFECTIVE
	3/1/72

APPROVED	ADMINISTRATOR - ENGINEERING DIVISION
<i>R. B. L.</i>	



EMBANKMENT PROTECTION



"T" SHALL BE 1.5' MINIMUM UNLESS OTHERWISE SPECIFIED ON PLANS.

"C" SHALL BE 2.0' MINIMUM UNLESS OTHERWISE SPECIFIED FOR MORE PROTECTION DUE TO SCOUR.

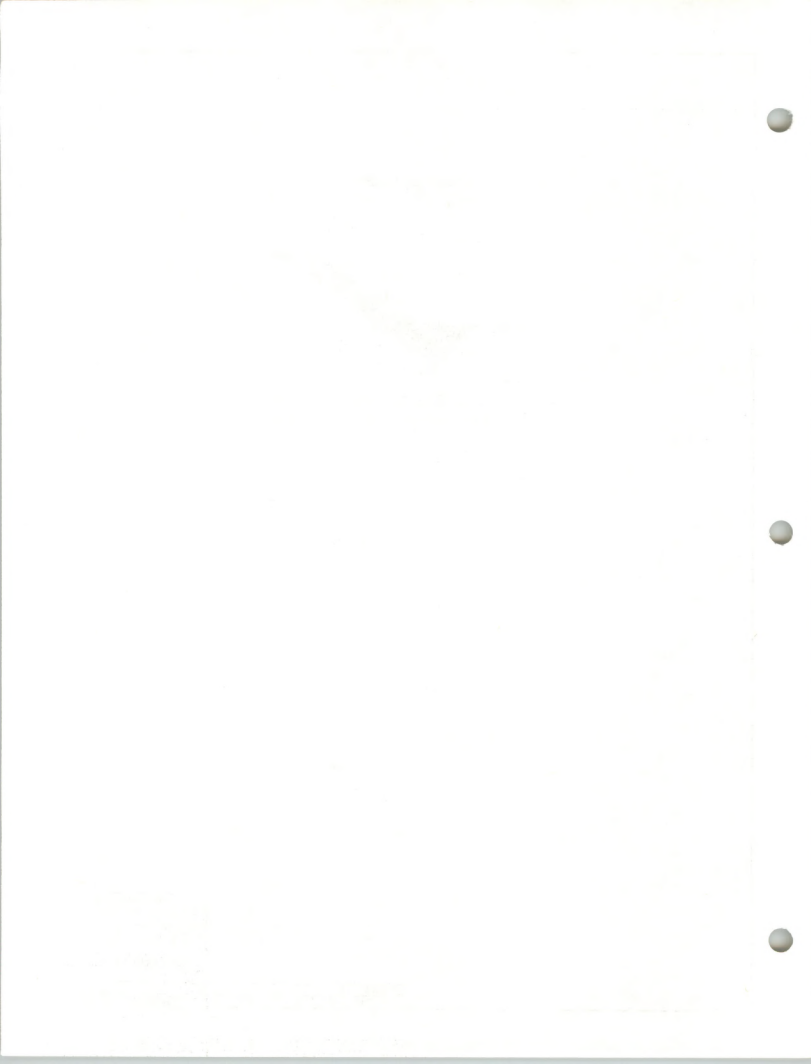
STANDARD DRAWING

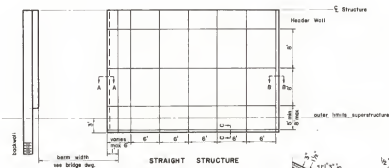
REFERENCE	DWG. NO.
STANDARD SPEC.	26
SECTION 50	

EMBANKMENT PROTECTION

REVISED			
EFFECTIVE	3/1/72		

APPROVED	
<i>P. B. B. B.</i>	
ADMINISTRATOR-ENGINEERING DIVISION	





STRAIGHT STRUCTURE

wire fabric
6"x6"x6 gauge

sand gravel cushion
as required

SECTION A-A

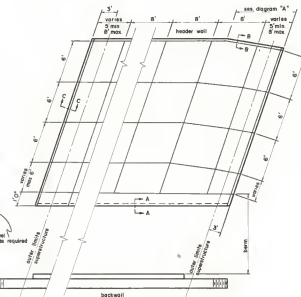


SECTION B-B
header wall

3" curb section shall be
monolithically placed with
the slope protection concrete.
dimension joints shall not
have 3" curb.



SECTION C-C



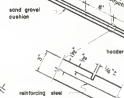
SKewed STRUCTURE



dimension varies but shall not
exceed 12 feet



DIAGRAM "A"



VERTICAL & HORIZONTAL
DIMENSION JOINT

To be placed at 6" vertical spacing or as noted
to be placed at 8" horizontal spacing or as noted.
Joints may be moved, made with grooving tools, or
removable inserts of an approved type.

VERTICAL & HORIZONTAL
CONSTRUCTION JOINT

Use as noted in printing data. When
required will be used in line of a dimension
joint of the same ending on a dimension
joint.

CAST IN PLACE CONCRETE

Location joints as indicated on the plans. If construction
is stopped for over two hours a construction joint shall be
made. Payment shall be the same as for concrete blocks.
Class "A" concrete shall be used for all cast-in-place concrete.

An approved one half inch expansion joint filler shall
be used wherever the cast in place concrete abuts against
any part of the bridge structure.

The embankment slope shall be cleared of all brush, debris
and rubble. A cushion is required for dirt embankment slopes.
Cushion is not required for gravelly embankment slopes. All slopes
shall be finished to a reasonably uniform surface or to the slope
indicated on the bridge plans. All loose material shall be compacted
to the satisfaction of the engineer. Adjacent slopes must be left
in a smooth, uniform condition.

REINFORCING STEEL

(may use other alternate listed below)

- 3 bars at 12" centers (horiz & vert spacing)
min cover of 1 inch
- Welded wire fabric, 6"x6"x6 gauge

See notes required at construction joints for reinforcing
steel

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	27
SECTION 25	
CONCRETE SLOPE PROTECTION	
REVISED	6/15/78
EFFECTIVE	6/15/78

REVISED	6/15/78	2/2/79	6/15/79
EFFECTIVE	6/15/78	6/15/79	6/15/79



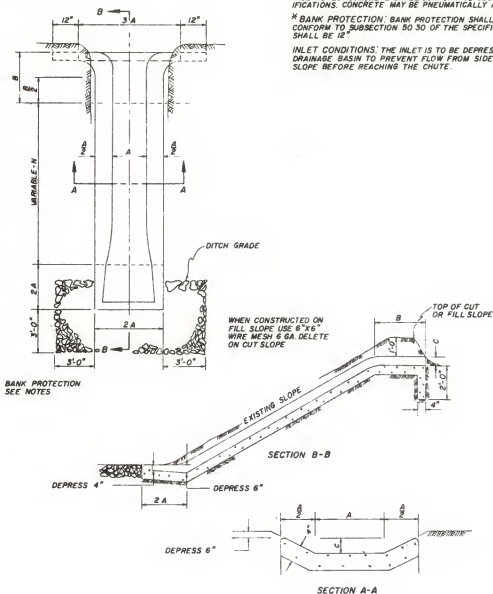
NOTES

SPECIFICATIONS: MONTANA DEPARTMENT OF HIGHWAYS STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, ADOPTED OCTOBER 1, 1970 AND ANY AMENDMENTS THERE TO, AND SPECIAL PROVISIONS SHALL GOVERN UNLESS OTHERWISE NOTED.

CONCRETE: ALL CONCRETE SHALL BE CLASS AC-DC UNLESS OTHERWISE NOTED. CONCRETE SHALL CONFORM TO SECTION 40 OF THE SPECIFICATIONS. CONCRETE MAY BE PNEUMATICALLY APPLIED.

* BANK PROTECTION: BANK PROTECTION SHALL BE TYPE 4 AND SHALL CONFORM TO SUBSECTION 80.50 OF THE SPECIFICATIONS. THICKNESS SHALL BE 12".

INLET CONDITIONS: THE INLET IS TO BE DEPRESSED BELOW THE NATURAL DRAINAGE BASIN TO PREVENT FLOW FROM SIDE CHANNELING OVER THE SLOPE BEFORE REACHING THE CHUTE.

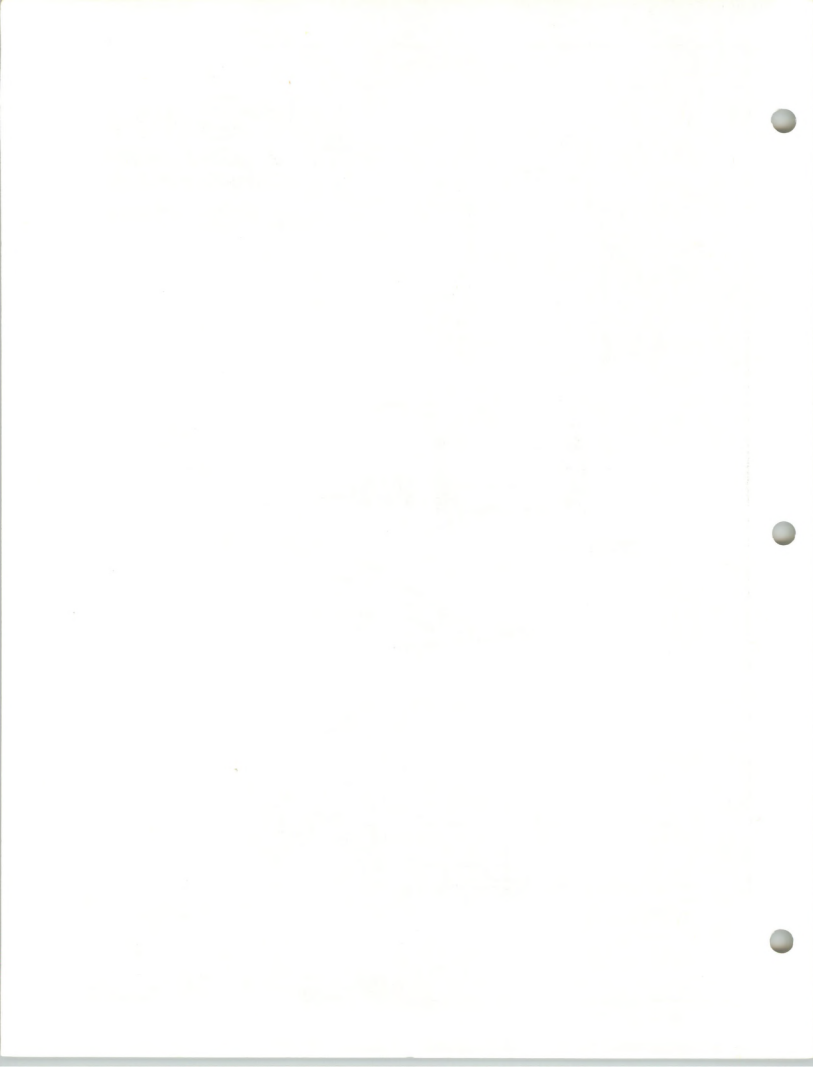


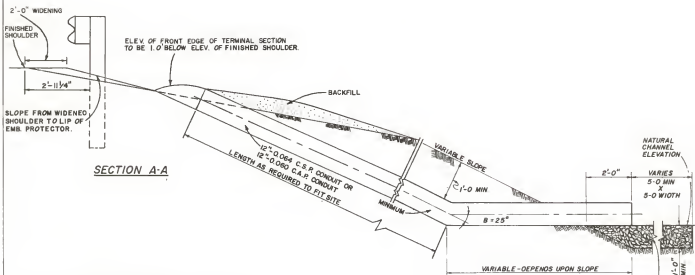
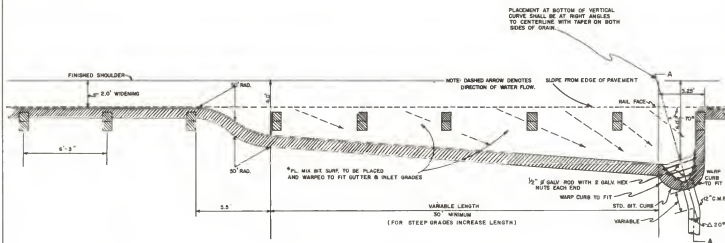
DIMENSIONS			QUANTITIES
A	B	C	CONCRETE CU. YD.
2'-0"	4'-0"	0'-4"	0.7 CU. YD. + NX 051 CU. YD. /LIN. FT.
2'-0"	4'-0"	1'-0"	0.9 CU. YD. + NX 056 CU. YD. /LIN. FT.
4'-0"	8'-0"	1'-0"	2.2 CU. YD. + NX 105 CU. YD. /LIN. FT.
4'-0"	8'-0"	1'-6"	2.3 CU. YD. + NX 111 CU. YD. /LIN. FT.

* EXCAVATION AND BANK PROTECTION TO BE INCLUDED IN THE UNIT PRICE BID FOR CONCRETE

STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	28
SECTION 80	
CONCRETE DRAINAGE CHUTE	
APPROVED BY	ADMINISTRATOR - ENGINEERING DIVISION

REVISED	
EFFECTIVE	3/1/72





GENERAL NOTES

CONDUIT MAY BE EITHER CIRCUMFERENTIAL OR HELICAL.
Ø AND Δ SHALL BE SHOWN UNLESS OTHERWISE SPECIFIED
IN THE PLANS OR BY THE ENGINEER.

CONTRACTOR SHALL NOT ORDER PIPE UNTIL DIRECTED BY THE ENGINEER.

FLARED END SECTION MAY BE CALLED FOR ON OUTLET
END WHEN SPECIFIED ON PLANS.

EMBANKMENT PROTECTOR SHALL BE BID AS UNIT PRICE
BID PER LIN. FT.

THE 12" FLARED END SECTION, 12" C.M.P. AND BENOS, ARE TO BE INCLUDED IN TOTAL LENGTH OF EMBANKMENT PROTECTOR.

ALL OTHER HARDWARE SHALL BE INCLUDED IN THE UNIT PRICE BID PER LIN. FT. OF EMBANKMENT PROTECTOR.

* INCLUDED WITH ROADWAY QUANTITIES.

APPROX 1 1/2 CU. YD TYPE 3 BANK PROTECTION-TO BE
PLACED IN MANNER BEST SUITED TO FIT EXISTING
CONDITIONS.

OUTLET: DETAIL

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	29
SECTION 56	
EMBANKMENT PROTECTOR	
APPROVED by <i>[Signature]</i> ADMINISTRATOR-ENGINEERING DIVISION	

REVISED		4/1/79
EFFECTIVE	3/1/72	6/1/79

APPROVED
BY L. R. B. B.
ADMINISTRATOR-ENGINEERING DIVISION



[illegible]

Diagram illustrating the dimensions and components of a pipe support bracket:

- PIPE SHELL**: The circular component supporting the pipe.
- ANCHOR BOLTS**: Indicated by "A" and "SEE DETAIL".
- Dimensions**:
 - 4" MIN.**: Horizontal distance from the left edge of the bracket to the center of the pipe shell.
 - 3'-0" MIN.**: Vertical distance from the bottom edge of the bracket to the center of the pipe shell.
 - 5" MIN.**: Horizontal distance from the center of the pipe shell to the right edge of the bracket.
 - 8"**: Vertical distance from the bottom edge of the bracket to the center of the anchor bolts.
- Material Specification**: **6X6-6/6 W.W.F. (TYP. FOR C.M.P. & R.C.P.)**.

VARIABLE - SEE
STD. DWG. NO. 44

VIEW A-A VARIABLE - SEE
STD. DWG. NO. 45

2 3X3X1/4 WELD TO DBL.
EXTRA STRONG PIPE
THREADED INSIDE WITH
STANDARD 3/4" THREAD

6" LONG FOR METAL PIPE
9" LONG FOR CONCRETE PIPE

NOTE: GREASE THREAD TO KEEP
MOISTURE OUT ON CONCRETE
INSTALLATION ONLY.

"X" IN FT.				N
DIA.	1/2:1	2:1	2 1/2:1	N
48"	.4	.9	.9	4
54"	.4	.9	.9	4
60"	.4	.9	.9	4
66"	.6	1.2	1.1	4
72"	.9	1.1	1.0	5
78"	1.1	1.7	1.2	5
84"	1.4	1.4	1.1	6

N=NUMBER OF ANCHOR BOLT

CUTOFF WALL FOR METAL CULVERT

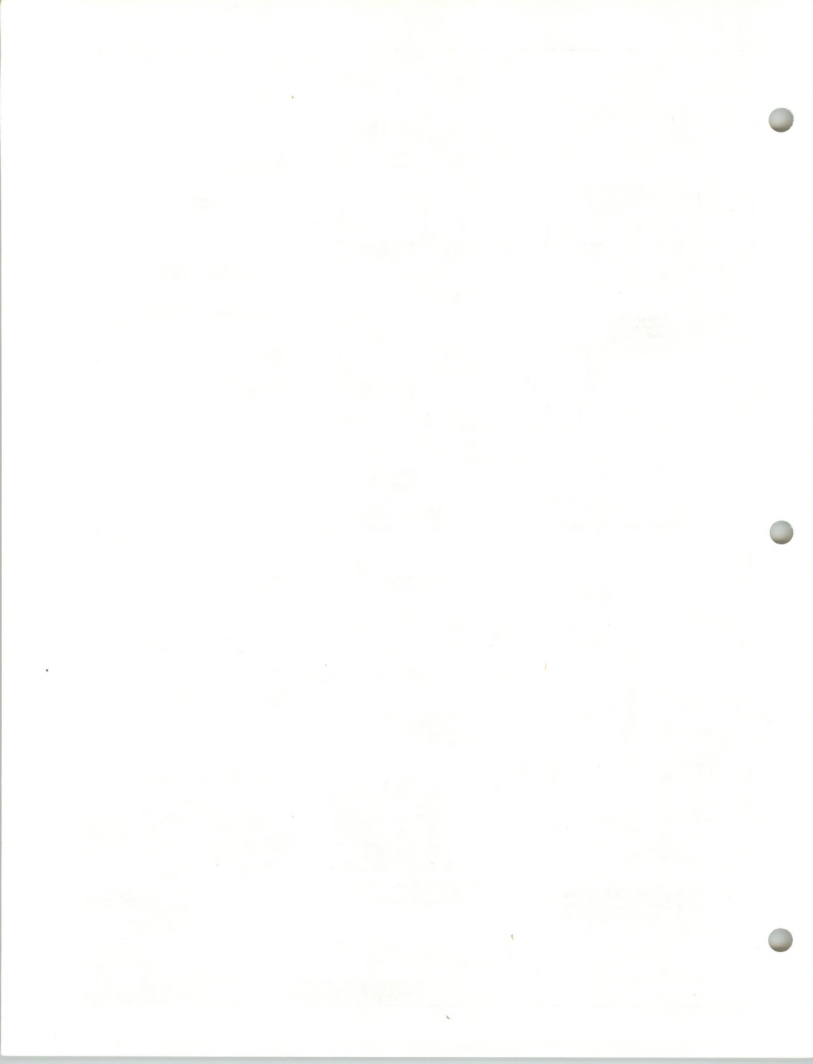
NOTES: DIMENSIONS BETWEEN MULTIPLE S.P.P.C. AND
S.P.P.A.C. SHALL BE A MAX. OF 6 FT. AND A
MINIMUM OF 4 FT. UNLESS OTHERWISE NOTED.
CDNCRETE - CL "DD" OR EQUAL, REINFORCING MAT'L. TO
BE INCLUDED IN UNIT PRICE BID PER CU YD. CONC.
ANCHOR BDLT'S TO BE INCLUDED IN THE UNIT PRICE BID
PER LIN. FT. OF PIPE.
SEE STD. DWG. NO. 4D 8 4I FOR BACKFILL UNDER CULVERTS.
SEE STD. DWG. NO. 25 FOR RIPRAP.

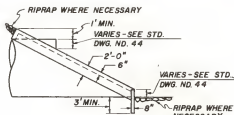
REFERENCE:	DWG. NO.
STANDARD SPEC.	30
SECTION 73	

CUTOFF WALLS FOR CULVERTS

REVISED	
EFFECTIVE	3/1/72

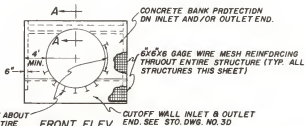
APPROVED
BY Jack R. Belsky
ADMINISTRATOR-ENGINEERING DIVISION





SIDE ELEV.

3/4" # 4 ANCHOR BOLTS AT ABOUT 16" CENTERS AROUND ENTIRE PERIMETER OF PIPE EMBEDDED IN CONCRETE. (TYP. ALL STRUCTURES THIS SHEET.) SEE DETAIL STD. DWG. NO. 3D



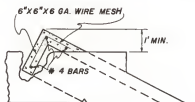
FRONT ELEV.

CONCRETE BANK PROTECTION ON INLET AND FOR OUTLET END.

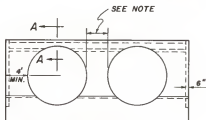
6x6x6 GA. WIRE MESH REINFORCING THROUGHT ENTIRE STRUCTURE (TYP. ALL STRUCTURES THIS SHEET)

CUTOFF WALL INLET & OUTLET END. SEE STD. DWG. NO. 3D

NOTE: DIMENSIONS BETWEEN MULTIPLE PIPES SHALL BE A MAX. OF 6' & A MIN. OF 4' UNLESS OTHERWISE NOTED.

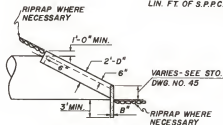


SECTION A-A

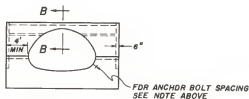


FRONT ELEVATION MULTIPLE PIPES

CL. "DO" CONCRETE OR EQUAL REINFORCING MAT'L. TO BE INCLUDED IN THE UNIT PRICE BID PER CU. YDS. OF CONCRETE. ANCHOR BOLTS TO BE INCLUDED IN THE UNIT PRICE BID PER LIN. FT. OF S.P.P.C. OR S.P.P.A.C.



SIDE ELEV.

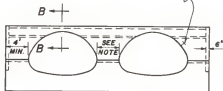


FRONT ELEV.

FOR ANCHOR BOLT SPACING SEE NOTE ABOVE



SECTION B-B



FRONT ELEVATION MULTIPLE PIPES

STANDARD DRAWING

REFERENCE DWG. NO.
STANDARD SPEC. 31
SECTION 73

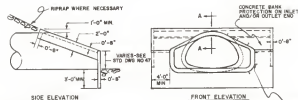
CONCRETE EDGE PROTECTION FOR STRUCTURAL PLATE PIPE CULVERT & FOR STRUCTURAL PLATE PIPE ARCH CULVERT

APPROVED
BY *J.R.P.L.*
ADMINISTRATOR-ENGINEERING DIVISION

REVISED
EFFECTIVE 3/1/72



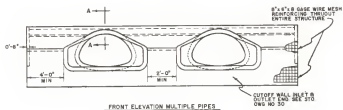
ARCH CULVERT



CLASS "M" CONCRETE OR EQUAL, REINFORCED WITH 10# BARS TO BE INCLUDED IN THE UNIT PRICE AND NO. 30 OF CONCRETE. (ANCHOR BOLTS TO BE INCLUDED IN THE UNIT PRICE AND NO. 30 OF PIPE OR ARCH CULVERT)



8\"/>

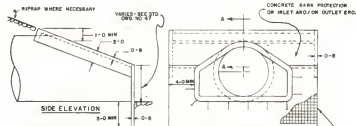


FRONT ELEVATION MULTIPLE PIPES

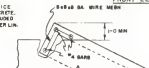
Size	Single Pipe			Dual Pipe		
	sq ft wire mesh	ft. 10# bars	cu yds. concrete	sq ft wire mesh	ft. 10# bars	cu yds. concrete
48"	223	478	4.5	331	770	5.7
64"	282	49.3	6.7	346	805	7.1
80"	242	31.0	5.0	362	640	7.4
78"	249	57.5	5.1	382	870	7.6

* FOR ESTIMATING PURPOSES ONLY
QUANTITIES INCLUDE CUTOFF WALL AND EDGE PROTECTION

PIPE CULVERT



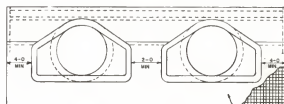
CLASS "M" CONCRETE OR EQUAL, REINFORCED WITH 10# BARS TO BE INCLUDED IN THE UNIT PRICE AND NO. 30 OF CONCRETE. (ANCHOR BOLTS TO BE INCLUDED IN THE UNIT PRICE AND NO. 30 OF PIPE OR ARCH CULVERT)



8\"/>

SECTION A-A

8\"/>



FRONT ELEVATION MULTIPLE PIPES

Size	Single Pipe			Dual Pipe		
	sq ft wire mesh	ft. 10# bars	cu yds. concrete	sq ft wire mesh	ft. 10# bars	cu yds. concrete
48"	223	47.8	4.5	331	77.0	5.7
64"	282	49.3	6.7	346	80.5	7.1
80"	242	31.0	5.0	362	64.0	7.4
78"	249	57.5	5.1	382	87.0	7.6

* FOR ESTIMATING PURPOSES ONLY
QUANTITIES INCLUDE CUTOFF WALL AND EDGE PROTECTION

CUT OFF WALL INLET & OUTLET END SEE STD DWS NO 30

STANDARD DRAWING

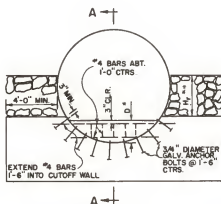
REFERENCE: STD. DWS. NO. 30
SECTION 73

CONCRETE EDGE PROTECTION FOR CONCRETE CULVERTS

APPROVED: *[Signature]*
FOR THE DISTRICT ENGINEER, CONCRETE WORKING

REVISED: *[Signature]*
EFFECTIVE: 3/1/72





ELEVATION

NOTE: SEE STD. DWG. NO. 30 FOR ANCHOR BOLT DETAILS.

* H_R = HEIGHT OF RIMRAIP (SEE ROAD PLAN)

† ON THE DESIGN 102, THE BACKFILL MATERIAL SHALL BE CRUSHED TOP SURFACING ONLY.

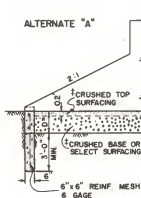
DIAMETER (inches)	D*
102	0.8'
126	1.2'
162	2.2'
180	2.0'
198	2.6'
210	1.6'

DIAMETER (inches)	CONCRETE QUANTITIES (CU. YDS.)		
	BACKFILL RETAINER	CUTOFF WALL	TOTAL CONCRETE
102	0.1	1.7	1.8
126	0.2	2.0	2.2
162	0.4	2.8	3.2
180	0.4	3.1	3.5
198	0.6	3.5	4.1
210	0.3	3.3	3.6

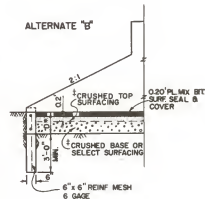
NOTE: CONCRETE SHALL BE CLASS "DD" OR EQUAL.

CONCRETE QUANTITIES ARE FOR ONE END ONLY.

REINFORCING MATERIAL TO BE INCLUDED IN UNIT PRICE BID PER CU. YD. CONC.
ANCHOR BOLTS TO BE INCLUDED IN THE UNIT PRICE BID PER LIN. FT. PIPE.



SECTION A-A



SECTION A-A

SURFACING QUANTITIES PER LINEAL FOOT										
DIAMETER (inches)	ALTERNATE "A"		ALTERNATE "B"							
	CUBIC TOP SURF.	YARDS CR. BASE OR SEL. SURF.	TON		CUBIC TOP SURF.	YARD CR. BASE OR SEL. SURF.	TONS BITUM. MAT'L.			
			COVER MAT'L	PLANT MIX			PRIME	PLANT MIX	SEAL	
102	0.100	—	—	—	—	—	—	—	—	—
126	0.047	0.156	0.0093	0.096	0.045	0.111	0.0009	0.0062	0.0009	
162	0.073	0.489	0.0135	0.146	0.069	0.408	0.0014	0.0095	0.0014	
180	0.073	0.446	0.0142	0.146	0.071	0.375	0.0014	0.0096	0.0014	
198	0.088	0.712	0.0167	0.176	0.084	0.627	0.0017	0.0114	0.0017	
210	0.074	0.333	0.0140	0.141	0.067	0.267	0.0014	0.0092	0.0014	

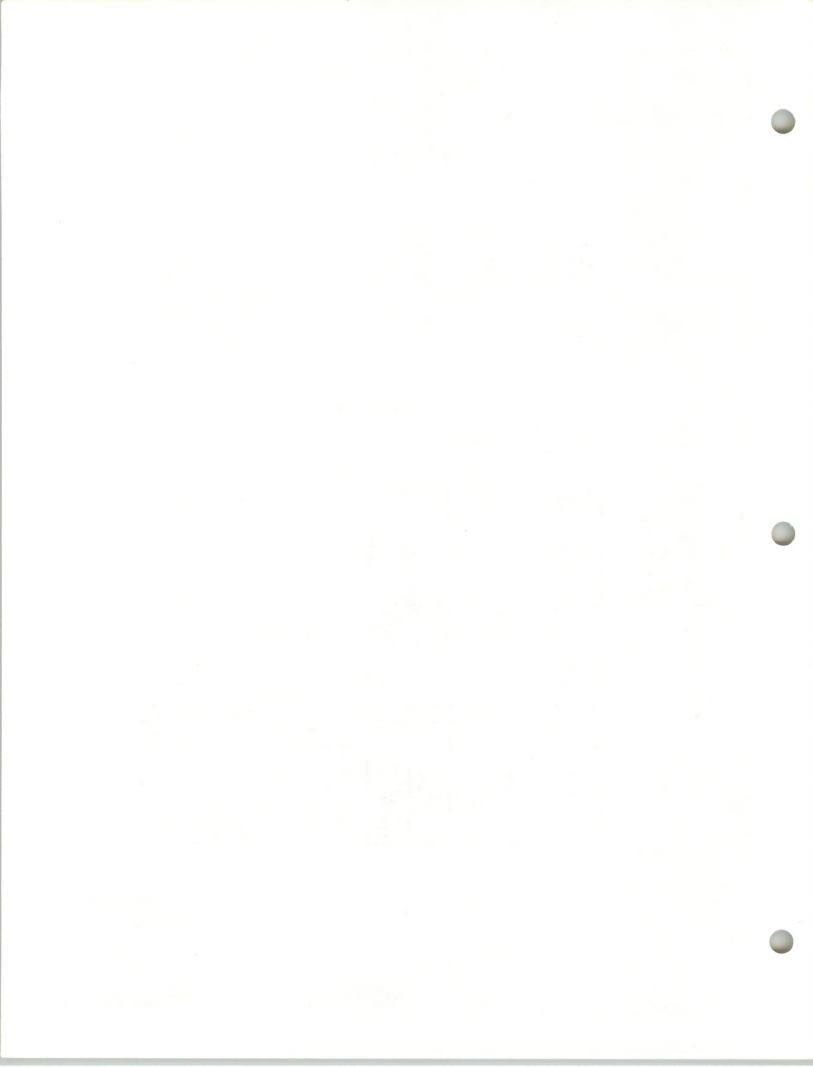
STANDARD DRAWING

REFERENCE: DWG. NO. 33
STANDARD SPEC.
SECTION 81

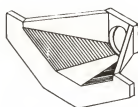
BACKFILL RETAINER AND CUTOFF WALL
FOR VEHICULAR UNDERPASS

REVISED
EFFECTIVE 3/1/72

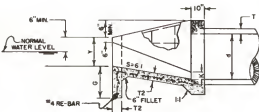
APPROVED
BY: *[Signature]*
ADMINISTRATOR—ENGINEERING DIVISION



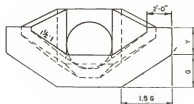




PICTORIAL VIEW OF TRANSITION



SECTION 8-8

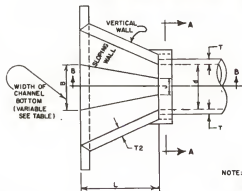


ELEVATION

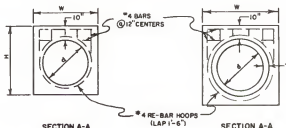
PLACE RE-BAR IN CENTER OF WALLS, SLAB, ETC. UNLESS OTHERWISE NOTED.

NOTE: SPACING REINFORCING BAR ABOUT 18" EACHWAY THROUGHOUT STRUCTURE. USE CONTINUOUS BARS IN FLOORS AND WALLS WHENEVER POSSIBLE. WHEN SPLICES ARE MADE, LAP REINFORCING BAR 1'-6".

NOTE: TRASHRACKS WILL BE PROVIDED WHEN REQUIRED, SEE STD. DWG. NO. 36.



PLAN VIEW



SECTION A-A
FOR C.M.P.

SECTION A-A
FOR R.C.P.

ALL EXPOSED CORNER TO BE CHAMFERED 1".

NOTE: INSTALL STRUCTURE A MINIMUM OF 30' FT. FROM NEAREST DRIVING LANE.

INLET & OUTLET CONCRETE TRANSITIONS FOR C.M.P.																			
CULVERT		DIMENSIONS (FT.-IN.)								QUANTITIES									
		G	J	H	L	T2	W	K	Y	B	CL'D'D' CONC. CULVERT	#4 RE-BAR LBS.	B	CL'D'D' CONC. CULVERTS	#4 RE-BAR LBS.	B	CL'D'D' CONC. CULVERTS	#4 RE-BAR LBS.	
DIA*4"	AREA SQ.FT																		
18"	1.77	2-0	0-5	3-5	3-0	0-6	2-9	0-4	1-3	1-6	0.8	69	2-6	0.9	74	3-6	1.0	80	
24"	3.14	2-0	0-7	4-0	4-0	0-6	3-3	0-5	1-6	2-0	1.2	96	3-0	1.3	102	4-0	1.4	108	
30"	4.91	2-0	0-9	4-6	5-0	0-6	3-9	0-7	1-9	2-6	1.5	122	3-6	1.6	129	4-6	1.7	136	
36"	7.07	2-6	0-11	5-1	6-0	0-6	4-3	0-8	2-0	3-0	2.1	167	4-0	2.2	174	5-0	2.3	184	
42"	9.62	2-6	1-0	5-8	7-0	0-6	4-9	0-9	2-3	3-6	2.6	200	4-6	2.8	211	5-6	2.9	221	
48"	12.57	2-6	1-0	6-3	8-0	0-8	5-3	0-11	2-6	4-0	4.2	257	5-0	4.2	267	6-0	4.6	276	

INLET & OUTLET CONCRETE TRANSITIONS FOR R.C.P.																			
CULVERT		DIMENSIONS (FT.-IN.)										QUANTITIES							
		G	J	H	L	T2	W	K	Y	8	CL'D'D' CONC. CULVERTS	#4 RE-BAR LBS.	8	CL'D'D' CONC. CULVERTS	#4 RE-BAR LBS.	8	CL'D'D' CONC. CULVERTS	#4 RE-BAR LBS.	
18"	1.77	2-0	0-5	3-8	3-0	0-5	0-6	3-2	0-4	1-3	1-6	0.9	74	2-6	0.9	80	3-6	1.0	85
24"	3.14	2-0	0-7	4-3	4-0	0-3	0-6	3-9	0-5	1-6	2-0	1.2	100	3-0	1.3	106	4-0	1.4	112
30"	4.91	2-0	0-9	4-10	5-0	0-3	0-6	4-4	0-7	1-9	2-6	1.6	127	3-6	1.7	134	4-6	1.8	141
36"	7.07	2-6	0-11	5-6	6-0	0-4	0-6	4-8	0-8	2-0	3-0	2.2	174	4-0	2.3	181	5-0	2.4	191
42"	9.62	2-6	1-0	6-1	7-0	0-4	0-6	5-6	0-9	2-3	3-6	2.7	212	4-6	2.8	222	5-6	2.9	232
48"	12.57	2-6	1-2	6-8	8-0	0-5	0-8	6-1	0-11	2-6	4-0	4.2	267	5-0	4.4	277	6-0	4.6	287

REINFORCING STEEL AS INDICATED TO BE INCLUDED IN THE UNIT PRICE BID PER CUBIC YARD OF CONCRETE.

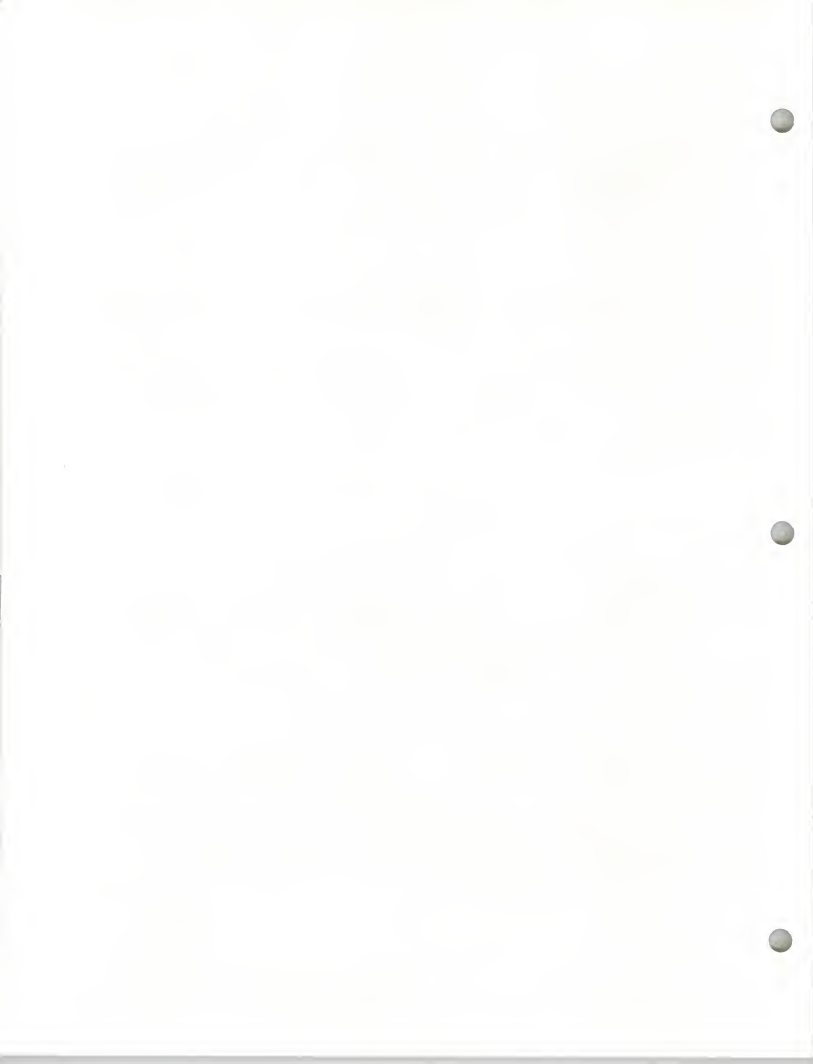
STANDARD DRAWING

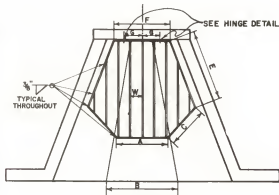
REFERENCE: DWG. NO. 35
STANDARD SPEC.
SECTION 73

CONCRETE IRRIGATION INLET AND
OUTLET TRANSITION FOR R.C.P. AND
C.M.P. PIPES

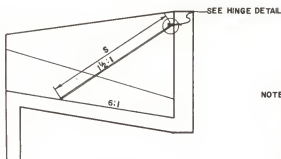
APPROVED: *Jack R. B. B.*
ADMINISTRATOR-ENGINEERING DIVISION

REVISED 3/11/72
EFFECTIVE 6/11/72

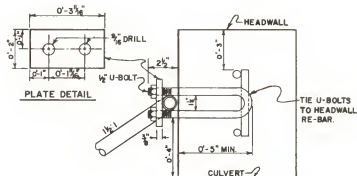




PLAN VIEW



SIDE VIEW



HINGE DETAIL

* $\frac{3}{8}$ " DIA EXTRA STRONG GALV. STEEL PIPE.
(OUTSIDE DIA. = 1.050")
(INSIDE DIA. = 0.742")
(PIPE = 1.47 LB/LINEAR FT.)

OR
* $\frac{3}{8}$ " DIA REINFORCING BAR
(RE-BAR = 1.043 LB/LINEAR FT.)

NOTE:
PAINT ALL WELDS AND OTHER NON-GALVANIZED
PARTS IN ACCORDANCE WITH STANDARD SPECS.
SH" PAINTS AND PAINTING.

USE OF PIPE OR RE-BAR FOR TRASHGUARD TO
BE DETERMINED BY THE ENGINEER.

W=CENTER TO CENTER PIPE OR RE-BAR SPACING.

CULVERT DIA "d" INCHES	DIMENSIONS (FT.)							B (FT.-IN.)	B=d	
	A	C	E	F	S	W	G		* 3/8" G.S.P. OR * 3/8" RE-BAR (FT.)	1/2" U-BOLT (NO.) (WITH PLATE)
18	1.10	.95	2.04	.80	2.76	.33	.25	1-6	19.6	2
24	1.45	1.20	2.35	1.30	3.46	.50	.50	2-0	24.5	2
30	1.83	1.60	3.13	1.75	4.32	.90	.75	2-6	36.6	2
36	2.19	1.95	3.62	2.25	5.02	.50	.90	3-0	49.3	2
42	2.56	2.23	4.15	2.78	5.75	.67	1.20	3-6	52.4	2
48	2.90	2.41	4.60	3.30	6.70	.67	1.50	4-0	62.3	2

CULVERT DIA. "d" INCHES	DIMENSIONS (FT.)							B (FT-IN.)	B=d+0" - O*	
	A	C	E	F	S	W	G		* G.S.P. OR RE-BAR (FT.)	* U-BOLT (NO.) (WITH PLATE)
18	1.85	.88	2.18	.75	2.76	.33	.25	2-6	23.7	2
24	2.19	1.15	2.62	1.25	3.46	.50	.50	3-0	27.7	2
30	2.60	1.51	3.22	1.70	4.32	.90	.70	3-6	39.5	2
36	2.90	1.85	3.71	2.25	5.02	.50	.90	4-0	53.3	2
42	3.23	2.20	4.20	2.75	5.75	.67	1.15	4-6	56.7	2
48	3.51	2.36	4.71	3.25	6.70	.67	1.45	5-0	65.4	2

CULVERT DIA "d" INCHES	DIMENSIONS (F.T.)							B (F.T.-IN.)	B=d+2'-0"	
	A	C	E	F	S	W	G		* % G.S.P. OR S-RE-BAR (F.T.)	1/2" U-BOLT (NO.) (WITH PLATE)
18	2.62	.83	2.25	.70	2.76	.33	.20	3-6	27.5	2
24	2.81	1.00	2.85	1.20	3.40	.50	.45	4-0	32.0	2
30	3.28	1.42	3.32	1.65	4.32	.50	.65	4-6	43.6	2
36	3.60	1.78	3.78	2.20	5.02	.50	.90	5-0	57.2	2
42	3.92	2.15	4.32	2.72	5.75	.67	1.15	5-6	60.3	2
48	4.14	2.30	4.60	3.20	6.70	.67	1.45	6-0	67.7	2

DIMENSIONS AND QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY.

STANDARD DRAWING

REFERENCE : DWG. NO.
STANDARD SPEC. 36
SECTION 73

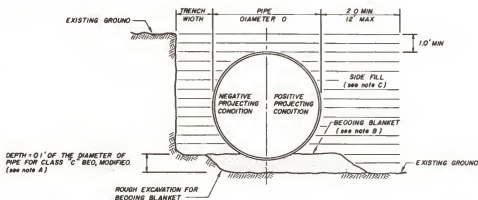
TRASHGUARD FOR CONCRETE IRRIGATION INLET AND OUTLET TRANSITION STRUCTURES

REVISED
EFFECTIVE 3/11/72

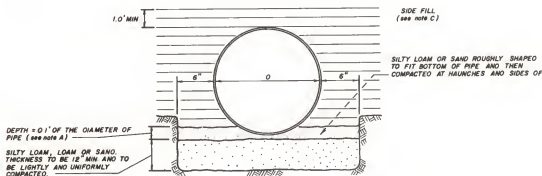
APPROVED
ADMINISTRATOR-ENGINEERING DIVISION



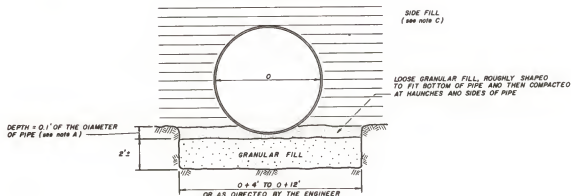
1-PIPE INSTALLATION AND BEDDING (CLASS C, MODIFIED)



2-ROCK



3-FOUNDATION STABILIZATION



NOTES

- (A) FOR STRUCTURAL PLATE PIPE, THE LENGTH OF BEDDING ARC NEED NOT EXCEED WIDTH OF BOTTOM PLATE.
- (B) BEDDING BLANKET OF SILTY LOAM OR SAND ROUGHLY SHAPED TO FIT BOTTOM OF PIPE. MINIMUM THICKNESS BEFORE PLACING PIPE IS 3".
- (C) SIDE FILL TO BE COMPACTED IN 6" LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE ARTICLE 11.05 OF STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.

STANDARD DRAWING

REFERENCE	DWG. NO
STANDARD SPEC.	4D
SECTION 54	

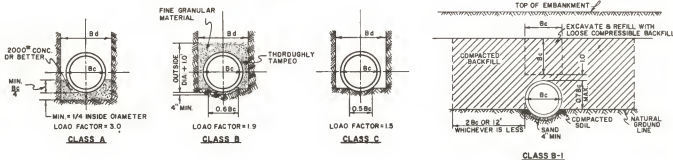
C.S.P. & S.S.P.
CULVERT BEDDING

REVISED			
EFFECTIVE	3/11/72		

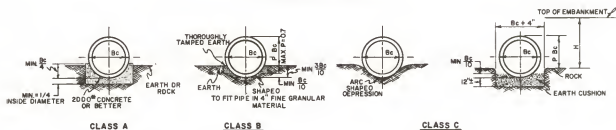
APPROVED	
ADMINISTRATOR-ENGINEERING DIVISION	



TYPES OF TRENCH BEDDING



TYPES OF EMBANKMENT BEDDING



DESCRIPTION OF BEDDING CLASSES

CLASS A CONCRETE CRADLE BEDDING. The lower part of the pipe exterior shall be bedded in a continuous cradle constructed of 2000 pound concrete or better, having a minimum thickness under the pipe of one-fourth the nominal inside diameter and extending up the sides of the pipe for a height equal to one-fourth of the outside diameter. The cradle shall have a width at least equal to the outside diameter of the pipe plus 8" and it shall be constructed monolithically without horizontal construction joints.

CLASS B BEDDING. (1) This class of bedding for embankment condition is applicable only when the projection ratio is not greater than 0.7. The pipe shall be carefully bedded on fine granular materials over an earth foundation, accurately shaped by means of a template to fit the lower part of the pipe exterior for at least 10% of the culvert overall height. Compactable soil material shall then be rammed and tamped in layers not more than 6" thick, around the pipe for the remainder of the lower 20% of its height. Backfilling to the top of the pipe shall conform with the applicable provisions of the standard specifications.

(2) For trench conditions, the culvert is placed as described in B (1) except that the earth foundation needs to be shaped to fit the lower part of the culvert exterior for a width of at least 60% of the culvert breadth. Then the remainder of the culvert is entirely surrounded to a height of at least 12" above its top by granular material placed by hand to fill all spaces under and adjacent to the culvert. The fill is tamped thoroughly on each side and under the culvert as far as practicable in layers not to exceed 6" in thickness.

CLASS B-1 BEDDING. In this type of installation, sometimes called The Imperfect Trench Method, the pipe culvert shall be first installed in accordance with the requirements of B (2). Then the fill shall be compacted at each side of the pipe for a lateral distance equal to twice the outside diameter or 12", whichever is less, and carried up to an elevation above the top of the pipe equal to the outside diameter of the pipe plus 12". Next a trench equal in width to the outside diameter of the pipe shall be dug in the fill directly over the culvert, down to an elevation 12" above the top of the pipe. Care shall be exercised to keep the sides as vertical as possible.

After the trench is excavated, it shall be refilled with loose, highly compressible soil material. Straw, hay, leaves, brush or sawdust may be used to fill the lower one-fourth to one-third of the trench in order to insure high compressibility of this backfill. The backfill of straw, hay, etc. shall not be carried closer than 10" to the outside slope of the fill; the outside 10" shall be composed of impervious material, thoroughly compacted. After the backfill is completed, the balance of the fill shall be constructed by normal methods up to the finished grade of embankment.

CLASS C BEDDING. For projecting embankment culvert, this method of bedding is bedded with "ordinary" care in an earth foundation shaped in the form of an arc to fit the lower part of the culvert exterior with reasonably closeness for at least 10% of its overall height. The remainder of the pipe shall be surrounded by material placed by hand tools to fill completely all spaces under and adjacent to the pipe. Backfilling to the top shall then be completed as specified in the standard specifications. If the culvert is placed on rock foundations, projecting embankment culvert pipes are bedded on an earth cushion having a minimum allowable thickness of 12" and with the earth foundation carefully shaped and filled under the culvert the same as ordinary projecting embankment bedded on an earth foundation.

CLASS C-1 BEDDING. The pipe shall be installed in accordance with Class C Bedding. The Imperfect trench method shall then be used as described under Class B-1 Bedding.

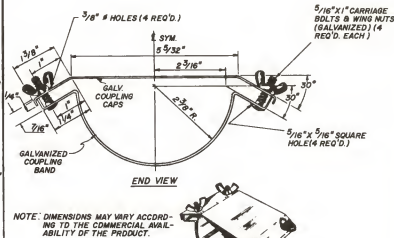
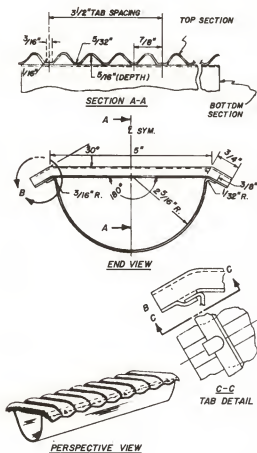
When natural ground material simulates bedding material, no special bedding material need be used. Use Class "C" unless otherwise noted on plans.

COMPACTION. All foundations shall be compacted.

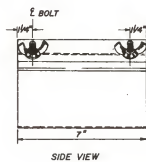
STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	41
SECTION 54	
R.C.P.	
CULVERT BEDDING	
APPROVED BY	ADMINISTRATOR - ENGINEERING DIVISION

REVISED	4/1/79
EFFECTIVE	3/11/72





NOTE: DIMENSIONS MAY VARY ACCORDING TO THE COMMERCIAL AVAILABILITY OF THE PRODUCT.



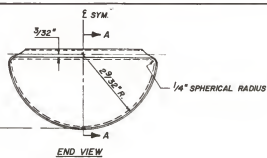
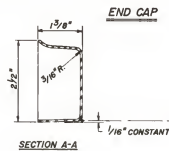
PERSPECTIVE VIEW

NOTES: ALL MATERIAL SHALL BE D.052"

SUBDRAIN PIPE SECTIONS SHALL CONFORM TO A.S.H.O. M-136-65

GALVANIZING OF NUTS, BOLTS, END SCREEN, END CAP AND OTHER LIKE PARTS SHALL CONFORM TO A.S.T.M. A 153.

COUPLING BAND DETAILS



NOTES: MATERIAL TO BE 18 GA. COPPER BEARING GALVANIZED STEEL.

END OF CAP TO FIT SNUG, WHEN INSERTED INSIDE END OF UNDERDRAIN.

TOLERANCES ARE $\pm 1/16$ " EXCEPT AS SHOWN.

$1/2$ " GALV. MESH SCREEN, SHAPED LIKE THE CAP, TO BE PROVIDED FOR EACH PIPE OUTLET.

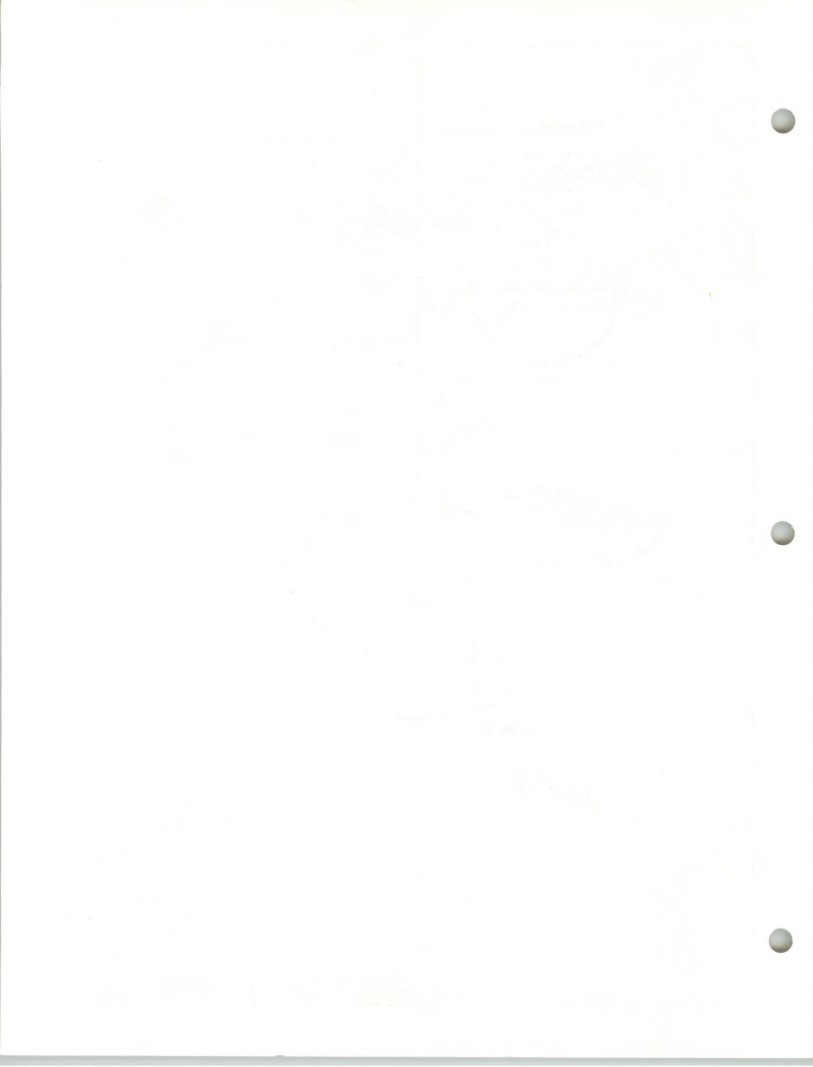
STANDARD DRAWING

REFERENCE: DWG. NO. 42
STANDARD SPEC. SECTION 69

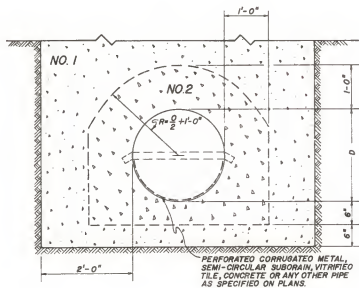
SEMICIRCULAR UNDERDRAIN

REVISED
EFFECTIVE 3/1/72

APPROVED
ADMINISTRATOR-ENGINEERING DIVISION



FOR PERFORATED CORRUGATED METAL PIPE, SEMI-CIRCULAR
SUBDRAIN OR *OPEN JOINT CONCRETE PIPE



NOTE: USE PULLBOARDS OF 0+6" HEIGHT TO
SEPARATE NO. 1 & NO. 2 MATERIAL DURING
PLACEMENT AND THEN REMOVE.

FILTER GRADATION	PERCENT PASSING STD. A.S.T.M. SIEVE											
	2	1/2	1/4	1	3/4	1/2	3/8	NO. 4	8	16	50	100
NO. 1							100	95-100	65-95	35-80	5-30	0-10
NO. 2	100	95-100	70-95		35-70		10-30	0-5				

*NOTE: WHEN OPEN JOINT PIPE IS USED JOINT SHOULD BE WRAPPED
WITH BRASS, BRONZE OR COPPER NO. 4 MESH HARDWARE
CLOTH BEFORE FILTER MATERIAL IS PLACED.

BOTH GRADATIONS SHALL BE COMBINED AND BIO AS *FILTER
MATERIAL.

STANDARD DRAWING

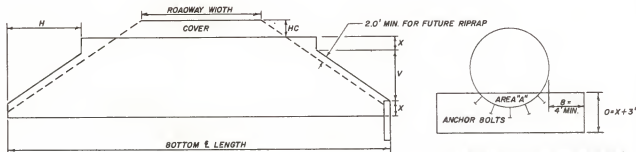
REFERENCE: DWG. NO. 43
STANDARD SPEC.
SECTION 54

FILTER MATERIAL
FOR UNDERDRAINS

REVISED
EFFECTIVE 3/1/72

APPROVED
BY: *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION





NOTE: FOR DETAILS, SEE STANDARD DWG. NO. 30
COVERING CUTOFF WALLS

DIA. (IN.)	X # (FT.)	H IN FEET FOR BEVELS OF:		V # (FT.)	AREA "A" SQ. FT.
		15:1	2:1		
48	1.000	3.000	4.000	2.000	2.46
54	1.125	3.375	4.500	2.250	3.11
60	1.250	3.750	5.000	2.500	3.83
66	1.375	4.125	5.500	2.750	4.44
72	1.500	4.500	6.000	3.000	5.53
78	1.625	4.875	6.500	3.250	6.61
84	1.750	5.250	7.000	3.500	7.51
90	1.875	5.625	7.500	3.750	8.61
96	2.000	6.000	8.000	4.000	9.81
102	2.125	6.375	8.500	4.250	11.08
108	2.250	6.750	9.000	4.500	12.42
114	2.375	7.125	9.500	4.750	13.84
120	2.500	7.500	10.000	5.000	15.38
126	2.625	7.875	10.500	5.250	16.98
132	2.750	8.250	11.000	5.500	18.50

DIA. (IN.)	X # (FT.)	H IN FEET FOR BEVELS OF:		V # (FT.)	AREA "A" SQ. FT.
		15:1	2:1		
138	2.875	8.625	11.500	5.750	20.30
144	3.000	9.000	12.000	6.000	22.10
150	3.125	9.375	12.500	6.250	24.00
156	3.250	9.750	13.000	6.500	25.9
162	3.375	10.125	13.500	6.750	27.9
168	3.500	10.500	14.000	7.000	30.1
174	3.625	10.875	14.500	7.250	32.2
180	3.750	11.250	15.000	7.500	34.6
192	4.000	12.000	16.000	8.000	39.3
198	4.125	12.375	16.500	8.250	41.7
204	4.250	12.750	17.000	8.500	44.2
210	4.375	13.125	17.500	8.750	46.9
216	4.500	13.500	18.000	9.000	49.7
228	4.750	14.250	19.000	9.500	55.5
240	5.000	15.000	20.000	10.000	61.5
252	5.250	15.750	21.000	10.500	67.7

TOLERANCE OF $\pm 4\%$ WILL BE ALLOWED IN ALL DIMENSIONS.

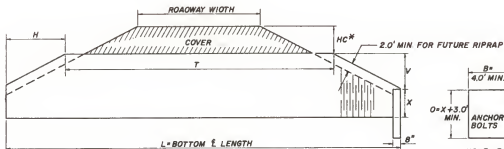
USE SKEW ENDS WHEN SKEW IS GREATER THAN 15° BUT NOT GREATER THAN 45° .

* FOR ELLIPTICAL PIPE, INCREASE VERTICAL DIMENSIONS BY PERCENT OF ELLIPSE.

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	44
SECTION 59	
STEP BEVEL FOR CIRCULAR C.S.P. & S.S.P.	
APPROVED	
BY <i>Richard R. Buehler</i>	
ADMINISTRATOR - ENGINEERING DIVISION	

REVISED	2/20/74
EFFECTIVE	3/11/72 2/11/75





NOTE - FOR DETAILS, SEE STANDARD DWG. NO. 30 COVERING CUTOFF WALLS.

TOLERANCE OF $\pm 4\%$ WILL BE ALLOWED IN ALL DIMENSIONS.
USE SKEW ENDS WHEN SKEW IS GREATER THAN 15° BUT NOT GREATER THAN 45° .

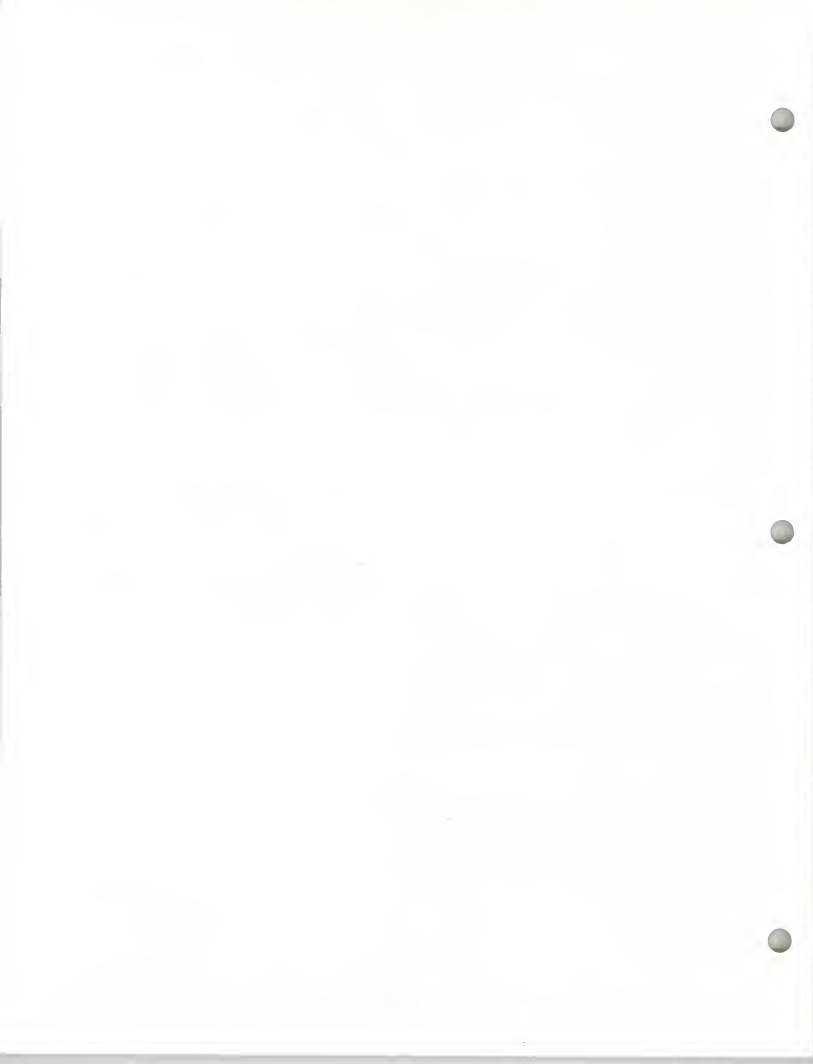
$$* HC = \frac{S}{4} \text{ OR A MIN. } = 24"$$

HC MEASURED VERTICALLY FROM FINISHED LOW SHOULDER TO TOP OF PIPE.

IF POSSIBLE IT IS DESIRABLE THAT TOP OF PIPE BE PLACED A MIN. OF 1.0' BELOW SUBGRADE SURFACE.

SPAN	RISE	EQUIV. DIA.	H IN FEET FOR BEVELS OF			V	X	AREA "A"
			1 1/2:1	2:1	2 1/2:1			
			18" CORNER PLATES					
6'-1"	4'-7"	66	3.5	4.7	5.8	2.3	2.3	12
6'-9"	4'-11"	72	3.8	5.0	6.3	2.5	2.4	14
7'-3"	5'-3"	78	4.8	6.3	7.9	3.2	2.1	14
7'-11"	5'-7"	84	5.1	6.8	8.5	3.4	2.2	15
8'-7"	5'-11"	90	5.4	7.2	8.9	3.6	2.3	17
9'-4"	6'-3"	96	5.7	7.7	9.5	3.8	2.4	19
9'-9"	6'-7"	102	6.0	8.2	10.0	4.0	2.5	21
10'-8"	6'-11"	108	6.3	8.3	10.4	4.2	2.8	25
11'-5"	7'-3"	114	6.6	8.8	11.0	4.4	2.6	27
11'-10"	7'-7"	120	7.7	10.2	12.7	5.1	2.5	26
12'-6"	7'-11"	126	7.9	10.5	13.1	5.3	2.7	29
12'-10"	8'-4"	132	9.0	12.0	15.0	6.0	2.3	29
31" CORNER PLATES								
14'-0"	9'-8"	144	9.6	12.8	16.0	6.4	3.3	39
15'-8"	10'-4"	156	10.2	13.6	17.0	6.8	3.5	44
16'-6"	11'-0"	168	11.4	15.2	19.0	7.6	3.4	47
17'-11"	11'-8"	180	12.2	16.2	20.2	8.1	3.6	53
19'-3"	12'-4"	192	12.8	17.0	21.2	8.5	3.8	60
20'-5"	13'-0"	204	13.8	18.4	23.0	9.2	3.8	63

STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	45
SECTION 59	
BEVEL ON STRUCT. PLATE PIPE-ARCH	
REVISED	
EFFECTIVE	3/1/72
APPROVED BY	<i>[Signature]</i>
ADMINISTRATOR-ENGINEERING DIVISION	



TYPICAL CROSS-SECTION
(ILLUSTRATED WITH TYPE 3 CONNECTION)

Case ID	Wb TCR- N63.9	GAMMA-1000					Type Conversion
		A	B	L	M		
		Wb Tcr	Wb Tcr	1 st Tcr	1 st Tcr	2 nd Tcr	
1 ^a	0.004	0	0	0	0	0	
2 ^a	0.004	0	0	0	0	0	
3 ^a	0.004	0	0	0	0	0	
4 ^a	0.004	0	0	0	0	0	
5 ^a	0.004	0	0	0	0	0	
6 ^a	0.004	0	0	0	0	0	
7 ^a	0.004	0	0	0	0	0	
8 ^a	0.004	0	0	0	0	0	
9 ^a	0.004	0	0	0	0	0	
10 ^a	0.004	0	0	0	0	0	
11 ^a	0.004	0	0	0	0	0	
12 ^a	0.004	0	0	0	0	0	
13 ^a	0.004	0	0	0	0	0	
14 ^a	0.004	0	0	0	0	0	
15 ^a	0.004	0	0	0	0	0	
16 ^a	0.004	0	0	0	0	0	
17 ^a	0.004	0	0	0	0	0	
18 ^a	0.004	0	0	0	0	0	
19 ^a	0.004	0	0	0	0	0	
20 ^a	0.004	0	0	0	0	0	
21 ^a	0.004	0	0	0	0	0	
22 ^a	0.004	0	0	0	0	0	
23 ^a	0.004	0	0	0	0	0	
24 ^a	0.004	0	0	0	0	0	
25 ^a	0.004	0	0	0	0	0	
26 ^a	0.004	0	0	0	0	0	
27 ^a	0.004	0	0	0	0	0	
28 ^a	0.004	0	0	0	0	0	
29 ^a	0.004	0	0	0	0	0	
30 ^a	0.004	0	0	0	0	0	
31 ^a	0.004	0	0	0	0	0	
32 ^a	0.004	0	0	0	0	0	
33 ^a	0.004	0	0	0	0	0	
34 ^a	0.004	0	0	0	0	0	
35 ^a	0.004	0	0	0	0	0	
36 ^a	0.004	0	0	0	0	0	
37 ^a	0.004	0	0	0	0	0	
38 ^a	0.004	0	0	0	0	0	
39 ^a	0.004	0	0	0	0	0	
40 ^a	0.004	0	0	0	0	0	
41 ^a	0.004	0	0	0	0	0	
42 ^a	0.004	0	0	0	0	0	
43 ^a	0.004	0	0	0	0	0	
44 ^a	0.004	0	0	0	0	0	
45 ^a	0.004	0	0	0	0	0	
46 ^a	0.004	0	0	0	0	0	
47 ^a	0.004	0	0	0	0	0	
48 ^a	0.004	0	0	0	0	0	
49 ^a	0.004	0	0	0	0	0	
50 ^a	0.004	0	0	0	0	0	
51 ^a	0.004	0	0	0	0	0	
52 ^a	0.004	0	0	0	0	0	
53 ^a	0.004	0	0	0	0	0	
54 ^a	0.004	0	0	0	0	0	
55 ^a	0.004	0	0	0	0	0	
56 ^a	0.004	0	0	0	0	0	
57 ^a	0.004	0	0	0	0	0	
58 ^a	0.004	0	0	0	0	0	
59 ^a	0.004	0	0	0	0	0	
60 ^a	0.004	0	0	0	0	0	
61 ^a	0.004	0	0	0	0	0	
62 ^a	0.004	0	0	0	0	0	
63 ^a	0.004	0	0	0	0	0	
64 ^a	0.004	0	0	0	0	0	
65 ^a	0.004	0	0	0	0	0	
66 ^a	0.004	0	0	0	0	0	
67 ^a	0.004	0	0	0	0	0	
68 ^a	0.004	0	0	0	0	0	
69 ^a	0.004	0	0	0	0	0	
70 ^a	0.004	0	0	0	0	0	
71 ^a	0.004	0	0	0	0	0	
72 ^a	0.004	0	0	0	0	0	
73 ^a	0.004	0	0	0	0	0	
74 ^a	0.004	0	0	0	0	0	
75 ^a	0.004	0	0	0	0	0	
76 ^a	0.004	0	0	0	0	0	
77 ^a	0.004	0	0	0	0	0	
78 ^a	0.004	0	0	0	0	0	
79 ^a	0.004	0	0	0	0	0	
80 ^a	0.004	0	0	0	0	0	
81 ^a	0.004	0	0	0	0	0	
82 ^a	0.004	0	0	0	0	0	
83 ^a	0.004	0	0	0	0	0	
84 ^a	0.004	0	0	0	0	0	
85 ^a	0.004	0	0	0	0	0	
86 ^a	0.004	0	0	0	0	0	
87 ^a	0.004	0	0	0	0	0	
88 ^a	0.004	0	0	0	0	0	
89 ^a	0.004	0	0	0	0	0	
90 ^a	0.004	0	0	0	0	0	
91 ^a	0.004	0	0	0	0	0	
92 ^a	0.004	0	0	0	0	0	
93 ^a	0.004	0	0	0	0	0	
94 ^a	0.004	0	0	0	0	0	
95 ^a	0.004	0	0	0	0	0	
96 ^a	0.004	0	0	0	0	0	
97 ^a	0.004	0	0	0	0	0	
98 ^a	0.004	0	0	0	0	0	
99 ^a	0.004	0	0	0	0	0	
100 ^a	0.004	0	0	0	0	0	

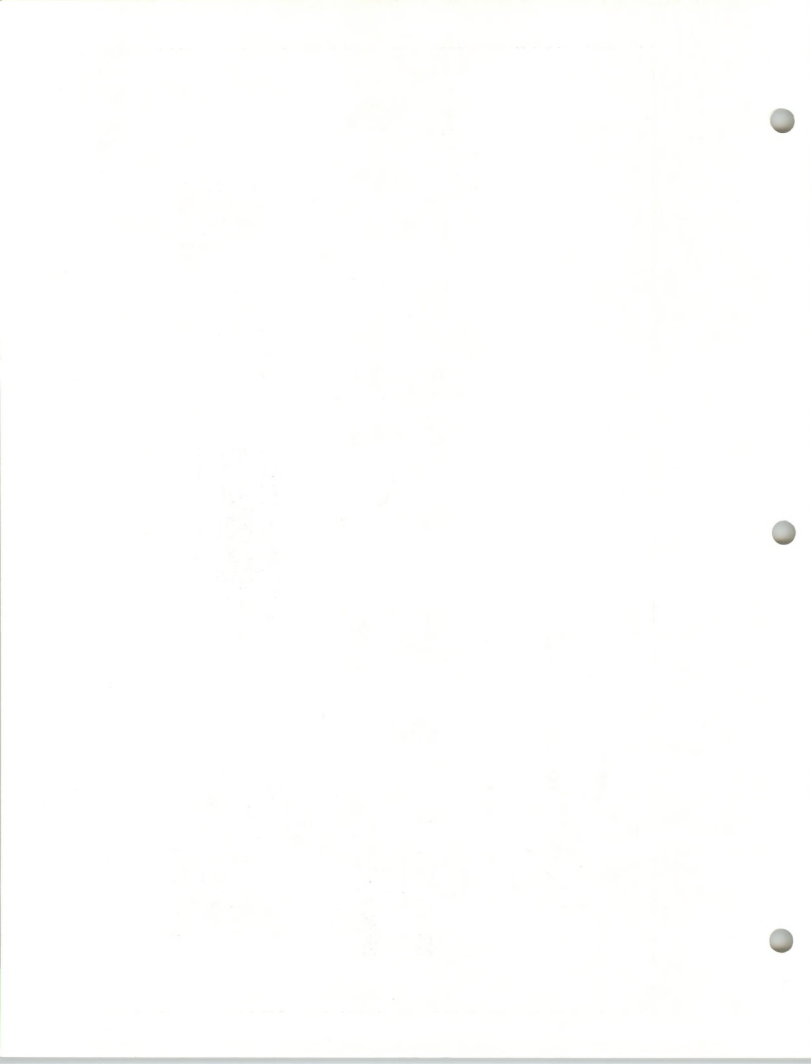
ANY AREA WHERE GALVANIZING IS BROKEN OR METAL IS BARE SHALL BE PAINTED WITH ONE COAT OF RED LEAD OR ZINC CHROMATE PRIMER AND TWO COATS OF ALUMINUM PAINT.

MINOR VARIATIONS IN DESIGN MAY BE ACCEPTABLE ON APPROVAL OF THE ENGINEER. SEAMS OR JOINTS LENGTHWISE OF THE APRON WILL BE ACCEPTABLE IF SECURELY BOLTED OR WELDED AND PAINTED AS PROVIDED ABOVE.

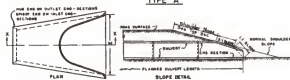
FOR TYPE OF CONNECTION ON ARCH AND ROUND PIPE
SEE DETAILS THIS SHEET.

[illegible]

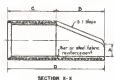
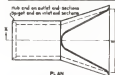
REVISED		12/20/74	4/1/75
EFFECTIVE	3/1/72	2/1/75	6/1/79



TYPE "A"

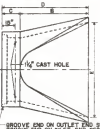
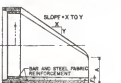
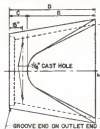
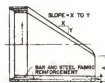


TYPE "A"						
TERMINAL		SECTION		DIMENSION		
DIAM.	A	B	C	D	E	F
12"	4"	2'-0"	4'-0 1/2"	6'-0 3/4"	2'	2'
18"	6"	2'-3"	3'-0"	6'-1"	2'-6"	2'-6"
18"	9"	2'-3"	3'-0"	6'-1"	3'-0"	3'-0"
24"	9 3/4"	3'-7 1/2"	2'-8"	6'-1 1/4"	4'-0"	4'-0"
30"	1'-0"	4'-6"	1'-7 1/2"	6'-1 3/4"	5'-0"	5'-0"
36"	1'-3"	5'-3"	2'-10 1/4"	6'-1 3/4"	6'-0"	6'-0"
42"	1'-6"	5'-3"	2'-11"	6'-2"	6'-6"	6'-6"
48"	2'-0"	6'-0"	2'-2"	6'-2"	7'-3"	7'-3"
54"	2'-3"	6'-6"	2'-11"	6'-2"	8'-0"	8'-0"



Tolerances, in the above tables, shall not vary more than $\pm 1.5\%$ for the dimensions shown. Otherwise they shall conform to AASHTO M-170.

TYPE "B"					
TERMINAL		SECTION		DIMENSION	
DIAM.	A	B	C	D	E
12"	4"	6"	4'-0"	6'-0"	2'
13"	6"	2'-3"	3'-0"	6'-1"	2'-6"
16"	6"	2'-3"	3'-0"	6'-1"	3'-0"
24"	9 1/2"	3'-1 1/2"	3'-0"	6'-1 1/2"	4'-0"
30"	1'-0"	4'-6"	1'-2 1/2"	6'-1 1/2"	5'-0"
36"	1'-3"	5'-3"	2'-10 1/2"	6'-1 1/2"	6'-0"
42"	1'-9"	5'-3"	2'-11"	6'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	6'-2"	7'-0"
54"	2'-6"	10'-0"	2'-6 1/2"	6'-2 1/2"	7'-6"



DIAM	SLOPE	T	A	B	C	D	E	F
60"	2:1	6'	23"	9'	33"	9'3"	6'	5'
72"	1.5:1	7'	5'	6'6"	7'6"	9'3"	9'	6'
96"	1.5:1	8'	5'	7'6"	7'6"	9'3"	10'	6'



TIE BOLTS. THE BOLTS TO BE USED ON 72" AND 84" FLANGED END SECTIONS. THREE TIE BOLDS, ONE AT TOP AND ONE ON EACH SIDE AT THE HORIZONTAL, SHALL BE USED WHEN REQUIRED. ALL PARTS SHALL BE GALVANIZED.

CONSTRUCTION. CONSTRUCTION SHALL CONFORM TO CLASS III, BRIDGE N 170, AS FAR AS DESIGN VILL PERMIT.

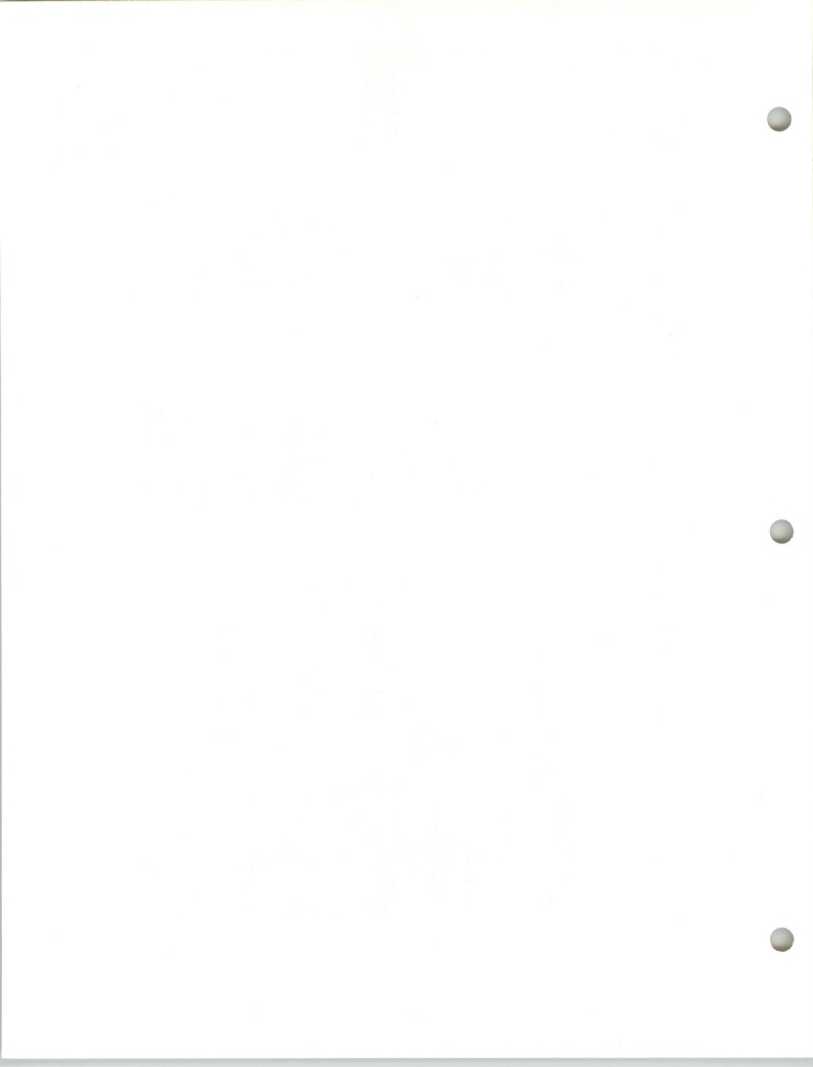
FLARED END TERMINAL SECTIONS WILL BE ENCLOSED IN

STANDARD DRAWING	
REFERENCE	DWG NO.
STANDARD SPEC.	47
SECTION 42	

PREFABRICATED TERMINAL SECTION

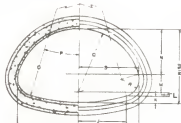
APPROVED
James R. Hackett
 ASSISTANT TRACER - ENGINEERING DIVISION

REVISED		12/20/71
EFFECTIVE	5/1/72	2/1/72





LONGITUDINAL SECTION



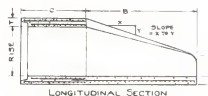
TRANSVERSE SECTION B END VIEW

SIZE	WATER AREA	SPAN/RISE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
18	1.2	22	2.5	0.7	2.9	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
24	2.8	22	3	0.7	3.5	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
30	4.2	22	3.5	0.7	4.1	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
36	5.6	22	4	0.7	4.7	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
42	7.0	22	4.5	0.7	5.3	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
48	8.4	22	5	0.7	5.9	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
54	9.8	22	5.5	0.7	6.5	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
60	11.2	22	6	0.7	7.1	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	
72	15.2	22	7	0.7	8.1	1.8	1.6	6	2	7.9	3	2	4	7	2.6	2.7	2.5	3.5	7.4	3.8	

MINIMUM REINFORCEMENT FOR EACH OF THE TWO LINES—
STEEL AREA IN SQUARE INCHES PER LINEAL FOOT OF PIPE
BARREL. A SINGLE LINE WILL BE USED IN 18" AND 24" SIZES.

CONCRETE STRENGTH IN TERMINAL SECTION SHALL BE EQUAL
TO MIN. STRENGTH SPECIFIED FOR BARREL SECTION.

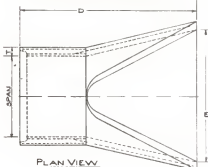
ASTM SPECIFICATIONS C-506 MAY TAKE PRECEDENCE OVER
DIMENSIONS SHOWN ABOVE. SEE STANDARD SPEC. FOR OTHER
REQUIREMENTS.



LONGITUDINAL SECTION



END VIEW



PLAN VIEW

SIZE	SPAN	RISE	T	A	B	C	D	E	R	SLOPE
18	22	2.5	0.7	2.9	1.8	1.6	6	2	7.9	3
24	22	3	0.7	3.5	1.8	1.6	6	2	7.9	3
30	22	3.5	0.7	4.1	1.8	1.6	6	2	7.9	3
36	22	4	0.7	4.7	1.8	1.6	6	2	7.9	3
42	22	4.5	0.7	5.3	1.8	1.6	6	2	7.9	3
48	22	5	0.7	5.9	1.8	1.6	6	2	7.9	3
54	22	5.5	0.7	6.5	1.8	1.6	6	2	7.9	3
60	22	6	0.7	7.1	1.8	1.6	6	2	7.9	3
72	22	7	0.7	8.1	1.8	1.6	6	2	7.9	3

FLARED END TERMINAL SECTION WILL BE INCLUDED IN LENGTH
OF PIPE SHOWN ON PLANS.

STANDARD DRAWING

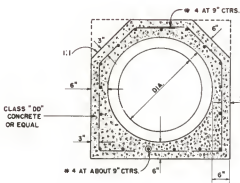
REFERENCE: DWG. NO.
STANDARD SPEC. 48
SECTION 63

PREFABRICATED R.C.P. ARCH CULVERT
AND TERMINAL SECTION

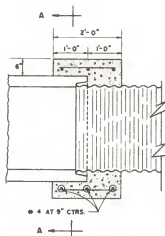
APPROVED
BY: *Charles H. Roberts*
ADMINISTRATOR—ENGINEERING DIVISION

REVISED
EFFECTIVE 3/1/72

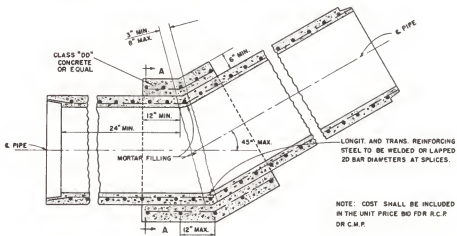




SECTION A-A



R.C.P. TO C.M.P. CONNECTION DETAIL



TYPICAL FIELD CAST CONCRETE BEND

NOTE: COST SHALL BE INCLUDED
IN THE UNIT PRICE BID FOR R.C.P.
OR C.M.P.

STANDARD DRAWING

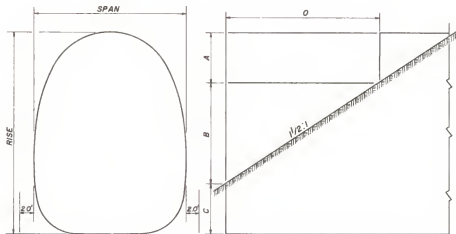
REFERENCE DWG. NO.
STANDARD SPEC. 49
SECTION 54

TYPICAL FIELD CAST CONCRETE BEND
R.C.P. TO C.M.P. CONNECTION

REVISED
EFFECTIVE 3/1/72

APPROVED BY *W. B. B. B.*
ADMINISTRATOR - ENGINEERING DIVISION





DIMENSIONS

DESIGN	SPAN	RISE	THICK	A*	B*	C*	D*
A	5'-10"	6'-6"	0.138"	1'-4"	3'-10"	1'-4"	5'-9"
B	5'-10"	7'-7"	0.138"	1'-8"	4'-7"	1'-4"	6'-10"

DESIGN "A" STOCKPASS: THE TOP OF THE STOCKPASS SHALL BE AN ARC HAVING A RADIUS OF NOT LESS THAN 26 INCHES OR MORE THAN 30 INCHES AND SHALL NOT BE LESS THAN 100° OR MORE THAN 130°. THE SIDES SHALL BE ARCS HAVING A RADIUS OF NOT LESS THAN 80 INCHES OR MORE THAN 72 INCHES. CORNERS SHALL BE ARCS HAVING A RADIUS OF NOT LESS THAN 17 INCHES OR MORE THAN 20 INCHES. THE BOTTOM SHALL BE A FLAT SEGMENT NOT LESS THAN 29 INCHES OR MORE THAN 34 INCHES IN WIDTH.

DESIGN "B" STOCKPASS: THE TOP OF THE STOCKPASS SHALL BE AN ARC HAVING A RADIUS OF NOT LESS THAN 24 INCHES OR MORE THAN 30 INCHES AND SHALL NOT BE LESS THAN 110° OR MORE THAN 145°. THE SIDES SHALL BE ARCS HAVING A RADIUS OF NOT LESS THAN 85 INCHES OR MORE THAN 112 INCHES. CORNERS SHALL BE ARCS HAVING A RADIUS OF NOT LESS THAN 17 INCHES OR MORE THAN 20 INCHES. THE BOTTOM SHALL BE A FLAT SEGMENT NOT LESS THAN 29 INCHES OR MORE THAN 34 INCHES IN WIDTH.

* FOR DESIGN PURPOSES ONLY, BEVELING SHALL COMMENCE AT THE BOTTOM OF THE TOP PLATE AND EXTEND DOWNWARD ON A 1/2:1 SLOPE TO THE TOP OF THE CORNER PLATE.

A TOLERANCE OF $\pm 4\%$ IN SPAN & RISE WILL BE ACCEPTABLE.

THE LENGTH SHALL BE MEASURED ALONG THE FLOW LINE OF THE STOCKPASS, END TO END OF STRUCTURE.

UNLESS OTHERWISE CALLED FOR, END PLATES SHALL BE BEVELED AS SHOWN ABOVE, AND SHALL BE MEASURED AND PAID FOR AT THE UNIT PRICE BID PER LINEAL FOOT OF STRUCTURAL PLATE PIPE STOCKPASS. WHEN ENDS ARE BEVELED, THE ANGLE OF SKEW SHALL NOT EXCEED 15° UNLESS OTHERWISE NOTED.

SEE STANDARD DRAWINGS CONCERNING BEDDING MATERIAL BENEATH THE STRUCTURE.

SEE STANDARD DRAWINGS CONCERNING RIPRAP WHEN TOE PROTECTION IS NECESSARY.

MINIMUM COVER = 2.0 FT. TO FINISH GRADE.

MAXIMUM COVER = 6.0 FT. TO FINISH GRADE.

FILL SLOPES SHALL BE WARPED A MINIMUM OF 25.0' ON EACH SIDE OF THE STOCKPASS TO FIT THE END BEVEL.

NOTE: INLET AND OUTLET END TREATMENT FOR ALL STOCKPASSES SHALL PROVIDE FOR CONCRETE EDGE PROTECTION, CUTOFF WALLS AND BACKFILL RETAINING WALLS. A GRAVEL SURFACE SHALL BE PROVIDED FOR THE INSIDE OF STRUCTURE. IF STRUCTURE IS USED FOR DUAL PURPOSE OF STOCK AND DRAINAGE, ASPHALT SURFACING SHALL BE PROVIDED. SURFACING TO BE SLANTED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE.

BOLTS FROM BOTTOM CORNER PLATES TO TOP OF STRUCTURE SHALL BE PLACED WITH BOLT HEAD ON INSIDE.

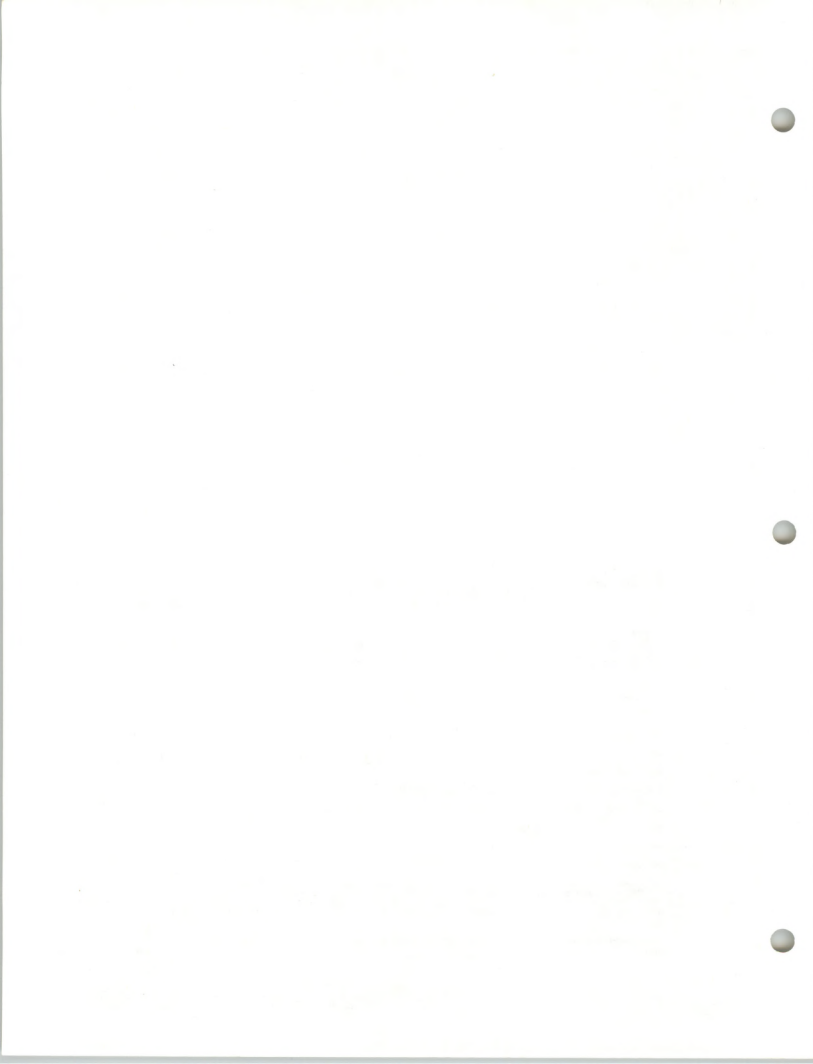
STANDARD DRAWING

REFERENCE: DWG. NO.
STANDARD SPEC. 50
SECTION 59

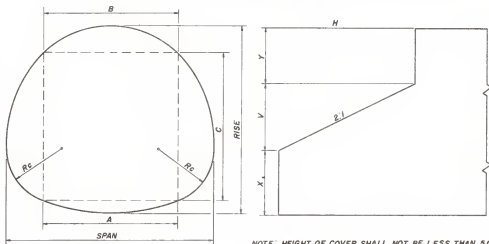
STRUCTURAL PLATE
PIPE STOCKPASS

APPROVED
BY: *Paul R. Babin*
ADMINISTRATOR-ENGINEERING DIVISION

REVISED
EFFECTIVE 3/1/72



NOTE: STRUCTURES OF A SIMILAR DESIGN MAY BE USED IF APPROVED BY THE ENGINEER.



NOTE: HEIGHT OF COVER SHALL NOT BE LESS THAN 30 FEET.

SPAN (FT.-IN.)	RISE (FT.-IN.)	A (FT.)	B (FT.)	C (FT.)	H (FT.)	V (FT.)	X (FT.)	Y (FT.)
12-2	11-0	10	8	8	10	5	3.709	2.291
13-10	12-2	10	8	10	5	5	3.82	3.347
14-10	14-0	12	10	10.5	10	5	3.87	5.13
15-8	15-0	12	10	12	10	5	3.957	6.043
16-5	16-0	12	10	13	12	6	3.828	6.172
17-3	17-0	12	10	14	12	6	4.796	6.244
19-1	17-2	16	12	13	12	6	4.794	6.373
20-4	17-9	16	12	14	12	6	4.785	6.965

SPAN (FT.-IN.)	RISE (FT.-IN.)	RADIUS Rc (IN.)	MINIMUM THICK. (IN.)	MAXIMUM HEIGHT OF COVER (FT.) *
12-2	11-0	38	0.109	17
13-10	12-2	38	0.109	15
14-10	14-0	38	0.109	14
15-8	15-0	38	0.109	12
16-5	16-0	38	0.138	12
17-3	17-0	47	0.138	11
19-1	17-2	47	0.168	10
20-4	17-9	47	0.188	10

TABLE BASED ON MINIMUM CORNER BEARING PRESSURE OF 2 TON/SQ. FT.

* FOR FILL HEIGHTS GREATER THAN MAXIMUM SPECIFIED, CONSULT MATERIALS BUREAU FOR SOIL BEARING STUDY.

NOTE: THESE STRUCTURES WILL BE DESIGNATED, IN PLANS AND PROPOSAL, AS "VEHICULAR UNDERPASS." MATERIALS, INSTALLATION AND OTHER PROVISIONS SHALL CONFORM TO THE STANDARD SPECIFICATIONS.

THE TERM "VEHICULAR UNDERPASS" WILL BE USED, REGARDLESS OF THE USE OR PURPOSE OF THE STRUCTURE.

INLET AND OUTLET END TREATMENT FOR ALL VEHICULAR UNDERPASSES SHALL PROVIDE FOR CONCRETE EDGE PROTECTION, CUTOFF WALLS AND BACKFILL RETAINING WALLS. SURFACING SHALL BE PROVIDED FOR THE INSIDE OF STRUCTURE. SURFACING TO BE SLANTED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE. BOLTS FROM BOTTOM CORNER PLATES TO TOP OF STRUCTURE SHALL BE PLACED WITH BOLT HEAD ON INSIDE.

STANDARD DRAWING

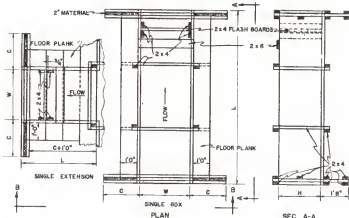
REFERENCE: DWG. NO. 51
STANDARD SPEC.
SECTION 59

VEHICULAR UNDERPASS

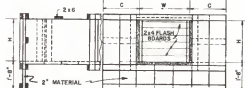
REVISED 4/1/79
EFFECTIVE 3/1/79 6/1/79

APPROVED BY: *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION

WOODEN



SEC. A-A



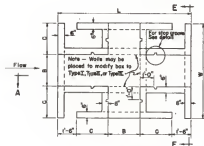
SEC. B-B

DIMENSIONS & MBM LUMBER									
SINGLE				BOX				SINGLE EXTENSION	
W	H	C	L	W	H	C	L	W	H
10'	10'	10'	25'	10'	10'	25'	25'	10'	10'
25'	25'	25'	10'	10'	10'	25'	25'	10'	10'
10'	25'	25'	10'	10'	25'	25'	10'	10'	25'
25'	25'	25'	10'	10'	25'	25'	10'	10'	25'
10'	25'	25'	10'	10'	25'	25'	10'	10'	25'
25'	25'	25'	10'	10'	25'	25'	10'	10'	25'
10'	25'	25'	10'	10'	25'	25'	10'	10'	25'
25'	25'	25'	10'	10'	25'	25'	10'	10'	25'

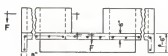
1-WAY - SINGLE BOX
2-WAY - SINGLE BOX + ONE EXTENSION
3-WAY - SINGLE BOX + TWO EXTENSIONS

SPICES AND FLOOR TO BE OF S4S
2" MATCHED MATERIAL.
NAILS TO BE INCLUDED IN UNIT
PRICE AND FOR LUMBER. ALL NAILS
TO BE GALVANIZED.
WHEN THE PLANS PROVIDE FOR
TREATED LUMBER, TREATMENT SHALL
BE DONE BY DIMENSIONS. LUMBER
IN A SOLUTION CONTAINING OR PENTA-
CHLOROPHENOL TREATMENT MUST BE
DONE IN SUCH A MANNER AND WITH
SUCH A CARRYING AGENT THAT THE
PENTA-NAIL-PENETRATES THE WOOD AT
LEAST ONE-FOURTH INCH.

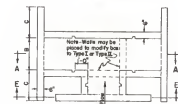
CONCRETE



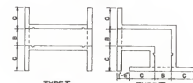
PLAN
TYPE IX



SECTION A-A



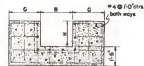
PLAN
TYPE IX



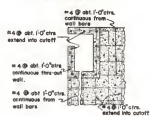
TYPE I

TYPE II

Note: Quantities for Type I and Type II are based on the dimensions given for "C" for Type I and "D" for Type II. Quantities for "W" may be substituted for "C" without re-computing quantities.



SECTION E-E



SECTION F-F

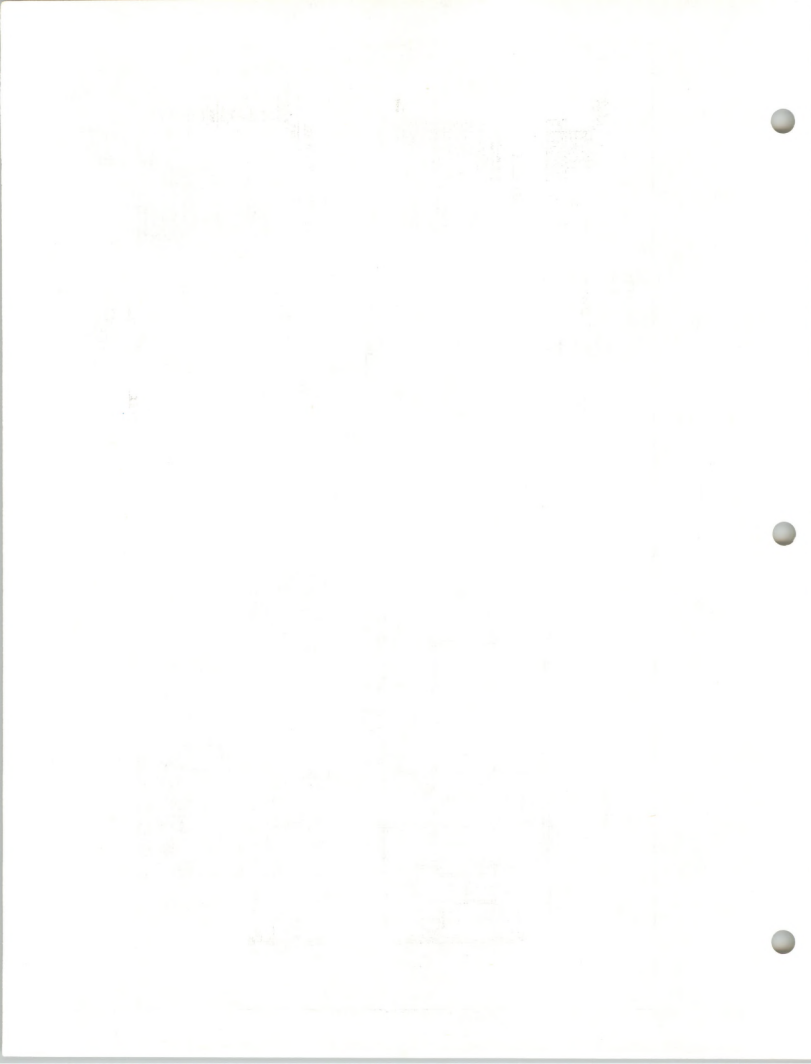
STOP GROOVE DETAIL

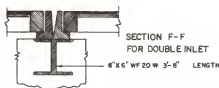
DIMENSIONS & QUANTITIES									
TYPE	B	C	H	L	W	STOP GROOVE	MBM	STOP GROOVE	MBM
TYPE I	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE II	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE III	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE IV	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE V	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE VI	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE VII	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE VIII	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE IX	25'	25'	25'	25'	25'	25'	25'	25'	25'
TYPE X	25'	25'	25'	25'	25'	25'	25'	25'	25'

Note: Quantities for Type I and Type II are based on the dimensions given for "C" for Type I and "D" for Type II. Quantities for "W" may be substituted for "C" without re-computing quantities.

STANDARD DRAWING		REFERENCE	
STANDARD SPEC.	OWE NO.	STANDARD SPEC.	OWE NO.
SECTION 73	92	SECTION 73	92
STANDARD IRRIGATION		DIVISION BOXES	
DIVISION BOXES		DIVISION BOXES	

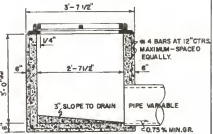
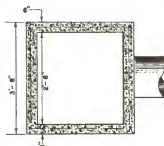
REVISION
EFFECTIVE 3/7/22





*QUANTITIES ARE FOR ESTIMATING ONLY

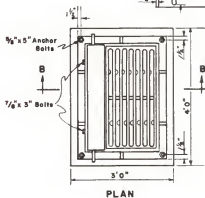
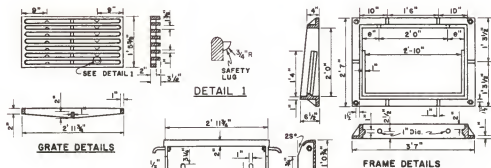
	CONCRETE	REIN. STL.
TYPE I	.45 CU. YDS.	40 LBS.
TYPE III	1.0 CU. YDS.	90 LBS.
TYPE II	1.5 CU. YDS.	145 LBS.



TYPE III

APPROVED
BY Jack R. Buehler
ADMINISTRATOR - ENGINEERING DIVISION



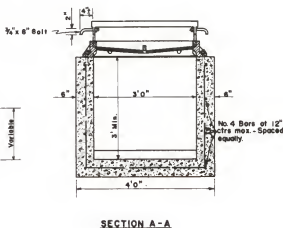
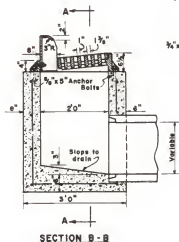


NOTES

For curb heights greater than 8 inches curb box may be modified. Curb and gutter to be warped to match drop inlet.

All concrete to be class "DD" OR EQUAL. These details to serve as an example only. Designers will design to fit specific conditions. See plans for details and quantities. Use local standards where available.

After placement of curb box, the adjustment slots may be filled to supply bearing to bolts so to carry wheel loads, or bolt holes may be drilled in curb box after grades are established.

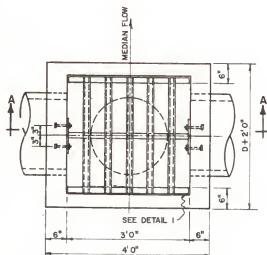


STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	54
SECTION 77	
CURB INLET BOX AND COVER	
APPROVED	
BY <i>[Signature]</i>	
ADMINISTRATOR-ENGINEERING DIVISION	

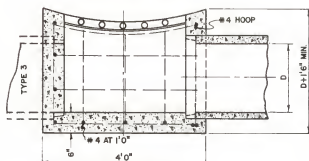
REVISED	4/1/79
EFFECTIVE	3/1/72



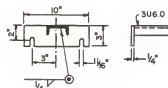
NOTE: WHEN MEDIAN INLET COVER IS INSTALLED OVER PIPES LARGER THAN 36", WITHOUT ADEQUATE COVER TO PERMIT THE USE OF TYPE 1 INSTALLATION, A DETAIL DRAWING OF THE INSTALLATION SHALL BE PROVIDED IN THE PLANS.



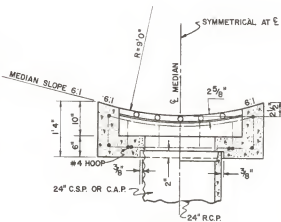
PLAN VIEW
TYPICAL FOR TYPES 1, 2, & 3



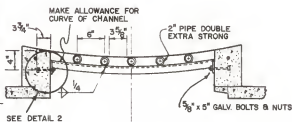
SECTION A-A
TYPE 2 & 3 - R.C.P., C.S.P. OR C.A.P.
TYPE 2 HAS 1 PIPE CONNECTION
TYPE 3 HAS 2 PIPE CONNECTION



DETAIL 2



SECTION A-A
TYPE 1



DETAIL 1

NOTES: ALL EXPOSED METAL PARTS TO BE PAINTED WITH ONE COAT OF RED LEAD AND TWO COATS OF ALUMINUM PAINT. UNIT PRICE BID FOR MEDIAN INLET COVER SHALL INCLUDE PAYMENT FOR THE CONCRETE, REINFORCING STEEL, GRATE, AND ADDITIONAL EXCAVATION, COMPLETE IN PLACE.

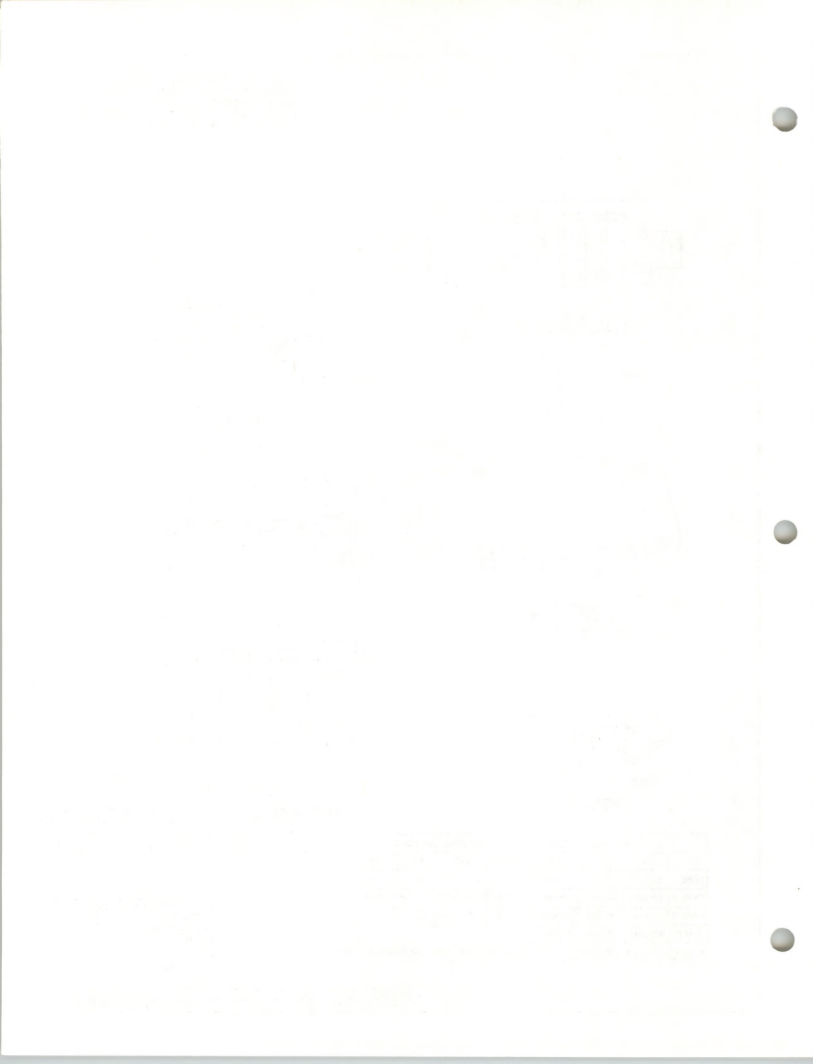
	* GRATE AND REINF. STEEL		
	24"	30"	36"
TYPE 1	50 LBS.	—	—
TYPE 2	85 LBS.	96 LBS.	105 LBS.
TYPE 3	85 LBS.	96 LBS.	105 LBS.
GRATE	165 LBS.	185 LBS.	210 LBS.

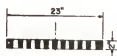
	* CL "DD" CONC. OR EQUAL		
	24"	30"	36"
TYPE 1	.5 CU. YDS.	—	—
TYPE 2	.9 CU. YDS.	1.1 CU. YDS.	1.3 CU. YDS.
TYPE 3	.9 CU. YDS.	1.0 CU. YDS.	1.1 CU. YDS.

* QUANTITIES ARE FOR ESTIMATING PURPOSES ONLY. TYPE 3 WILL BE A SPECIAL CASE TO BE FIGURED FOR THE PARTICULAR INSTALLATION.

STANDARD DRAWING	
REFERENCE STANDARD SPEC. SECTION 77	DWG. NO. 55
MEDIAN INLET COVER	
APPROVED BY <i>R. B. B.</i>	ADMINISTRATOR-ENGINEERING DIVISION

REVISED	
EFFECTIVE	3/11/72

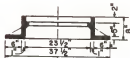




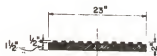
DETAIL
CATCH BASIN COVER



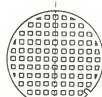
CATCH BASIN COVER



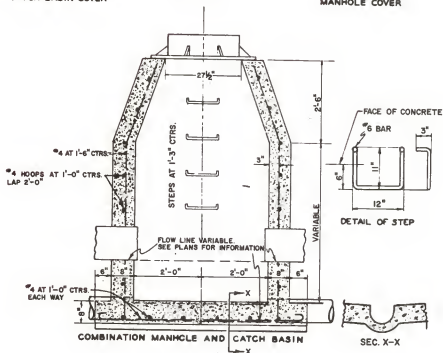
DETAIL
CASTING



DETAIL
MANHOLE COVER



MANHOLE COVER

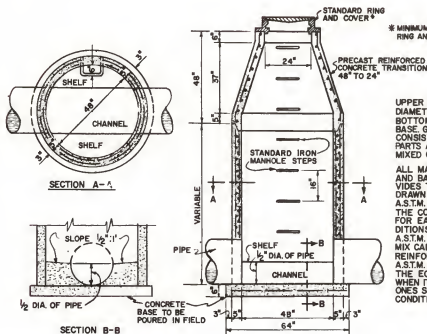


WALLS OF MANHOLE OR CATCHBASIN MAY BE EITHER CONCRETE OR CEMENT BLOCKS.
THE DETAILS SHOWN HERE ARE TO SERVE AS AN EXAMPLE.
DESIGNERS WILL DESIGN TO SPECIFIC CONDITIONS.
USE LOCAL STANDARDS WHERE AVAILABLE.
ALL CONCRETE TO BE CLASS "D" OR EQUAL.
THE COVER AND RING SHALL BE TOOLED TO A MACHINE FIT.
THIS STRUCTURE IS INTENDED TO BE CAST IN PLACE.

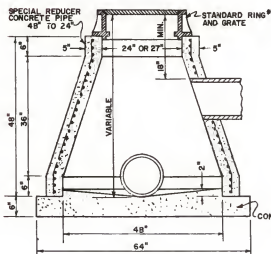
STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	56
SECTION 77	
COMBINATION MANHOLE AND CATCH BASIN	
REVISED	APPROVED
EFFECTIVE 3/1/72	<i>R. R. R.</i>
ADMINISTRATOR-ENGINEERING DIVISION	



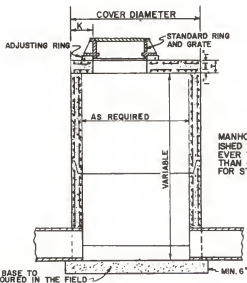
ANY OTHER TYPE OF MANHOLE REQUIRED WILL BE DESIGNED AND DESIGNATED AS "SPECIAL MANHOLE".



TYPE 1 MANHOLE

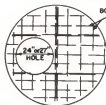


TYPE 2 MANHOLE



TYPE 3 MANHOLE

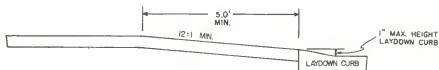
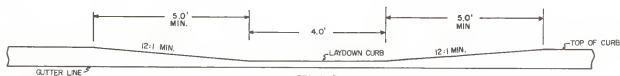
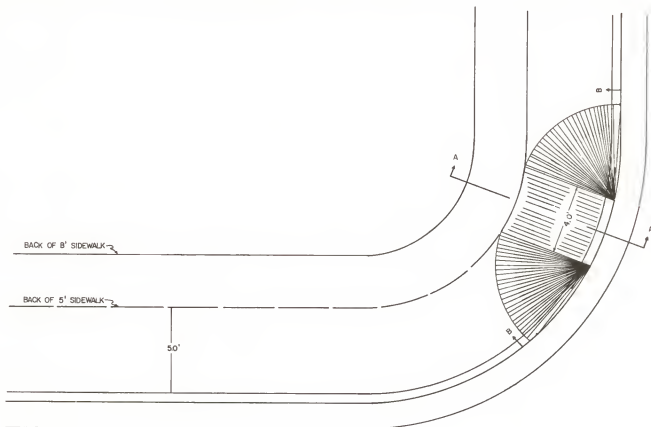
TYPE 3 M.H. COVER				
PIPE DIA.	COVER DIA.	T	K	
48"	50"	8"	8"	
54"	55"	8"	8"	
60"	72"	8"	7"	
66"	78"	8"	7"	
72"	86"	8"	8"	



STANDARD DRAWING	
REFERENCE: STANDARD SPEC. SECTION 77	DWG. NO. 57
PRECAST CONCRETE MANHOLE	
APPROVED: BY <i>Jack P. Baker</i> ADMINISTRATOR - ENGINEERING DIVISION	

REVISED	12/1/72	10/20/74
EFFECTIVE	3/1/72	1/1/73





NOTES:

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE SLOPE OF THE RAMP.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP, FREE OF SALS AND SHORT GRADE CHANGES.

IF POSSIBLE, DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMP EXCEPT WHERE EXISTING DRAINAGE STRUCTURES ARE BEING UTILIZED IN THE NEW CONSTRUCTION, LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER LOCATION OF DRAINAGE STRUCTURE.

THE NORMAL GUTTER LINE PROFILE SHALL BE MAINTAINED THROUGH THE AREA OF THE RAMP.

CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS.

WHEEL CHAIR RAMPS SHALL BE INSTALLED WITH ALL NEW SIDEWALKS.

FINAL LOCATION OF WHEEL CHAIR RAMPS SHALL BE DETERMINED BY THE ENGINEER.

NO SLOPE SHALL EXCEED 1:1 (12:1) ON THE RAMP OR SIDEWALK.

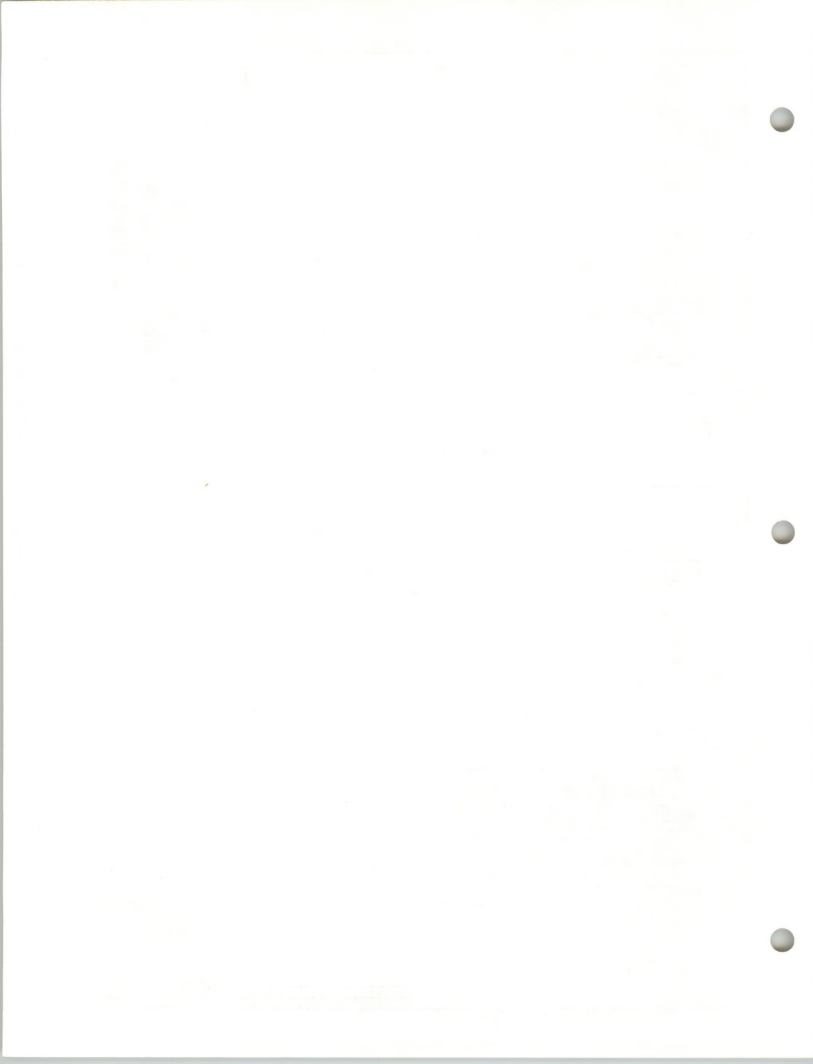
STANDARD DRAWING

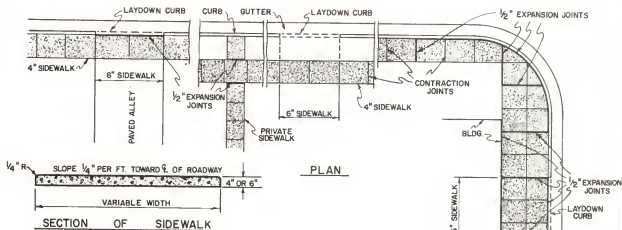
REFERENCE.	DWG. NO.
STANDARD SPEC.	64
SECTION 76	

WHEELCHAIR RAMP

REVISED				APPROVED	
EFFECTIVE	6/1/79			BY <i>K. S. [Signature]</i>	

ADMINISTRATOR-ENGINEERING DIVISION





SEE STANDARD SPECIFICATIONS FOR SIDEWALKS

PREFORMED EXPANSION JOINT FILLER, STANDARD SPEC M-150, SHALL BE INSTALLED AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE SIDEWALK AND WILL BE USED AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK AND STRUCTURES IN PLACE. PREFORMED EXPANSION JOINT FILLER SHALL BE INCLUDED IN THE UNIT PRICE BID PER SQUARE YARD FOR CONCRETE SIDEWALK.

ALL JOINTS SHALL BE STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE SIDEWALK. ALL JOINTS, WHERE PRACTICABLE, SHALL ALIGN WITH LIKE JOINTS IN ADJOINING

WORK. JOINTS SHALL BE USED TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH SHALL BE, SO FAR AS POSSIBLE, SQUARE. THE LENGTHS OF THE PANELS SHALL BE DETERMINED BY THE WIDTH OF THE SIDEWALK.

CONTRACTION JOINTS SHALL BE NOT MORE THAN 1/8 INCH WIDE AND NOT LESS THAN 1 INCH IN DEPTH AND MAY BE CUT BY A GROOVE FORMING TOOL.

EXPANSION JOINTS AT THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL BUT NOT TO EXCEED 60 FEET.

ALL SIDEWALKS WIDER THAN 5 FEET SHALL HAVE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF THE SIDEWALK.

STANDARD DRAWING

REFERENCE: DWG. NO. 65
STANDARD SPEC.
SECTION 76

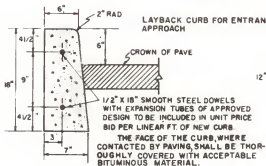
CONCRETE SIDEWALK

REVISED 4/1/73
EFFECTIVE 3/1/72 6/1/73

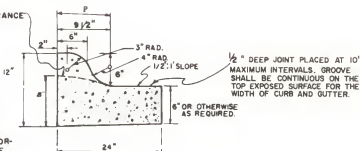
APPROVED BY: *R. P. Baker*
ADMINISTRATOR-ENGINEERING DIVISION



CONCRETE CURBS



CURB
 * 0.031 C.Y. CONC. PER 1.0'



CURB & GUTTER
 * 0.048 C.Y. CONC. PER 1.0' FOR 6" GUTTER

P - WHEN PAINTED CURB IS REQUIRED, THIS IS THE AREA TO BE COVERED.

JOINTS:

(A) When definitely tied to pavement slab.
 Separate curb or integral curb and gutter shall have the expansion joint of the pavement slab extended through and shall be completely filled with a minimum of 1" width of preformed expansion joint filler with dowel bars fitted with expansion tubes at each joint.

(B) When not tied to pavement slab.
 Separate curb or integral curb and gutter shall have through joints at predetermined intervals filled with a minimum of 1" width of preformed expansion joint filler. Such joint intervals shall be determined by prorating the distance between curb returns with such intervals to be not less than 50 feet nor greater than 80 feet. Preformed expansion joint filler shall be placed at all curb returns, bridges, drop inlets and where meeting curb and gutter in place.

Contraction joints in the curb and gutter shall be spaced at 10 foot intervals. These joints shall be 1/8" minimum width and constructed to a minimum depth of 1". Contraction joints shall be constructed by sawing or scoring. When scoring a tool shall be used which will leave the concrete rounded and destroy aggregate interlock to the depth specified for sawing of the joint.

(C) A minimum 1/4" width of preformed expansion joint filler shall be placed between the curb or gutter and any concrete pavement slab.

(D) A minimum 1/4" width of preformed expansion joint filler shall be placed between the curb and sidewalk as shown on S14 Dwg No. 65

(E) Preformed expansion joint filler shall comply with the requirements of Standard Spec. M-150.

RADIUS:

Minimum curb return radii - 10'

15' radii desirable for streets

CONCRETE:

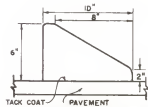
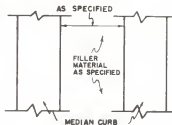
Unless otherwise specified, concrete curbs and concrete integral curb and gutter shall be constructed of air-entrained class "D" concrete or equal.

BITUMINOUS CURBS



THE CONTRACTOR MAY USE EITHER THE 6" OR THE 8" CURB.

CURB SECTION
 * 1 CU. Y. OF MATERIAL WILL MAKE ABOUT 5 LINEAR FT. OF CURB.



* 1 CU. Y. OF MATERIAL WILL MAKE ABOUT 3.5 LINEAR FT. OF CURB.

ALL MATERIALS AND CONSTRUCTION TO CONFORM TO STANDARD SPECIFICATIONS FOR BITUMINOUS CURB.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.

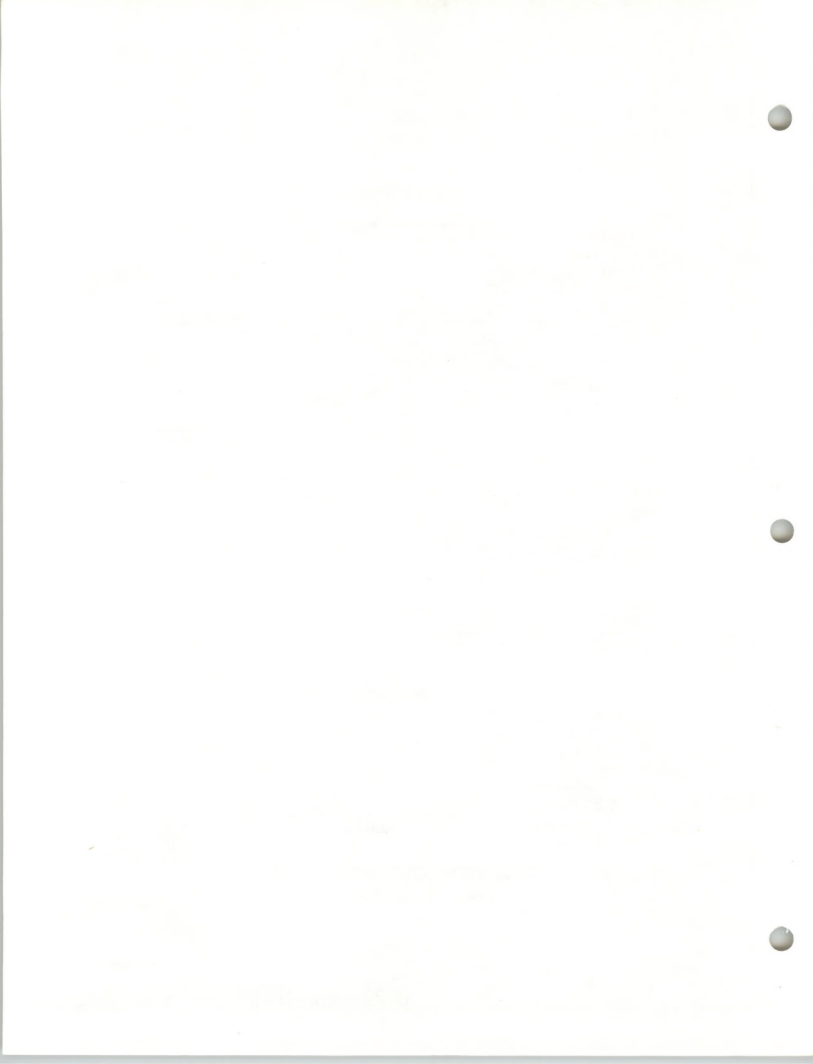
STANDARD DRAWING

REFERENCE: DWG NO. 66
 STANDARD SPEC. SECTION 75

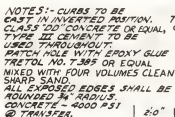
STANDARD CURBS

REVISED	12/20/74	4/1/75
EFFECTIVE	3/1/72	2/1/75

APPROVED
 BY: *P.R. Lee*
 ADMINISTRATOR - ENGINEERING DIVISION



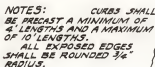
REINFORCE WITH 4 - $\frac{1}{4}$ " ϕ BARS, TO BE
CUT $\frac{1}{2}$ " BACK FROM FACE AT ENDS.
JACKING LOAD = 3.1 TONS EACH.



QUANTITIES (FOR ESTIMATING PURPOSES ONLY)
CONCRETE = 0.015 C.Y. PER 1.0'
REIN. STEEL = 0.7 LB. PER 1.0'

3/4" ϕ x 24" PLAIN BAR. (MINIMUM OF TWO
TO BE USED FOR EACH CURB SECTION.
MAXIMUM SPACING 6.0')

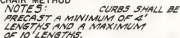
REINFORCE WITH 4 #4 LONGITUDINAL BARS
W/ 5 OR LARGER WIRE AT 2' CENTERS OR
APPROVED CHAIR METHOD



QUANTITIES (FOR ESTIMATING
PURPOSES ONLY)
CONCRETE = 0.015 C.Y. PER 10'
REIN. STEEL = 2.7 LBS. PER 1.0'

TYPES "A" & "B"
CONCRETE SHALL BE
CLASS "DD" OR CONCRETE
OF EQUAL STRENGTH.

REINFORCE WITH 4 4 LONGITUDINAL BARS
TIE W1.5 OR LARGER WIRE TO EVERY REIN-
FORCING BAR AT 2' CENTERS OR APPROVED
CHAIR METHOD



QUANTITIES (FOR ESTIMATING
PURPOSES ONLY.)
CONCRETE = 0.023 C.Y. PER 1.0'
REIN. STEEL = 2.7 LBS. PER 1.0'

ALL EXPOSED EDGES
SHALL BE ROUNDED
3/4" RADIUS.

**SURFACING
CALLED FOR
TYPICAL SECT**

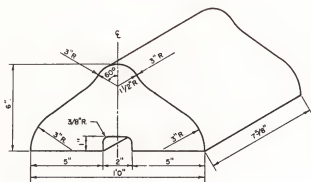
NOTE: REINFORCING STEEL IS NOT
REQUIRED IF CONCRETE CURB IS CAST
IN PLACE.

REFERENCE:	DWG. NO.
STANDARD SPEC.	67
SECTION 75	

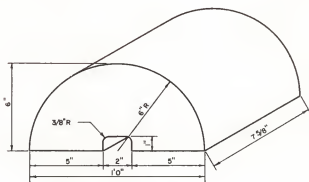
PRECAST CONCRETE CURBS

APPROVED
BY Jack R. Bush
ADMINISTRATOR - ENGINEERING DIVISION

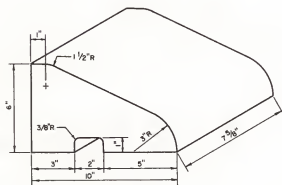




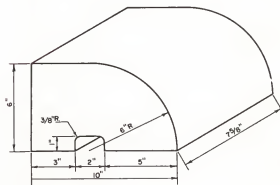
TYPE I BLOCK



TYPE I REFLECTOR BLOCK



TYPE II BLOCK



TYPE II REFLECTOR BLOCK

NOTES:

Every sixth block shall be a reflector block, unless otherwise specified.
Concrete shall be Class "DD" or concrete of equal strength.
Blocks shall be set with approved Portland cement grout or with an approved adhesive agent.

STANDARD DRAWING

REFERENCE : DWG. NO. 68
STANDARD SPEC. SECTION 75

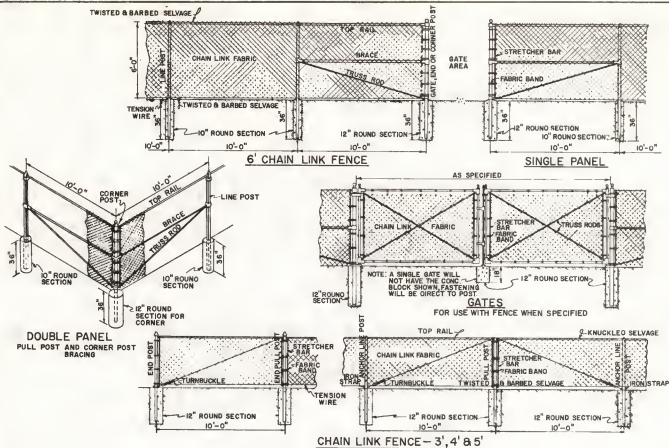
PRECAST TRAFFIC CURBS

REVISED
EFFECTIVE 3/11/72

APPROVED
BY *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION







A SINGLE PANEL SHALL BE PLACED AT EVERY END OF CHAIN LINK FENCE. SEE SPECIFICATIONS FOR MATERIALS.

SEE STANDARD SPECIFICATIONS FOR FURTHER REQUIREMENTS.

GATES ARE INCLUDED ON THIS STANDARD FOR USE IN SPECIAL CASES ONLY. THEY SHALL NOT BE INSTALLED AT ANY LOCATION UNLESS SPECIFIED BY THE ENGINEER.

LINE POSTS ON 3 FOOT AND 4 FOOT FENCE SHALL BE DRIVEN OR SET IN CONCRETE AS FIELD CONDITIONS WARRANT. THE TWO POSTS ADJACENT TO THE PULL POST SHALL BE SET IN CONCRETE.

PULL POST BRACING ON 6 FOOT FENCE SHALL BE SAME AS CORNER BRACING SHOWN IN DETAIL UPPER LEFT.

ALL CONCRETE IS CLASS "B" OR BETTER.

DOUBLE PANELS SHALL BE INSTALLED NO MORE THAN 300 FEET APART ON TANGENT AND USED FOR PULLING. SUCH PANELS SHALL BE PLACED AT EACH END OF EACH CURVE SHARPER THAN 5° AND BE APPROXIMATELY EVENLY SPACED BETWEEN, ABOUT 20° OF CENTRAL ANGLE (10° DEFLECTION) APART, BUT NOT MORE THAN 250 FEET APART ON ANY CURVE. SEE SPECIFICATIONS FOR MATERIALS.

HEIGHT OF FABRIC	WIRE FABRIC ABOVE GROUND	DEPTH OF CONCRETE	POST IN CONC. (MIN.)
6'	1'-2"	36"	32"
5'	1'-2"	36"	32"
4'	1'-2"	30"	26"
3'	1'-2"	30"	26"

STANDARD DRAWING

REFERENCE:
STANDARD SPEC.
SECTION 80

DWG. NO.
76

CHAIN LINK FENCE

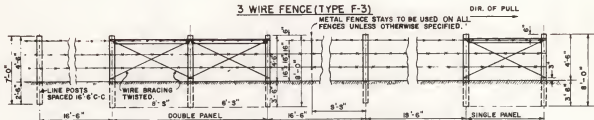
REVISED
EFFECTIVE 3/1/72

4/1/73
6/1/73

APPROVED
ADMINISTRATOR-ENGINEERING DIVISION



3 WIRE FENCE (TYPE F-3)

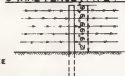


4 WIRE FENCE (TYPE F-4)

ALL WIRE
SPACING SHOWN
IS APPROXIMATE



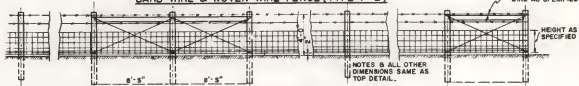
5 WIRE FENCE (TYPE F-5)



6 WIRE FENCE (TYPE F-6)



BARB WIRE & WOVEN WIRE FENCE (TYPE F-2)



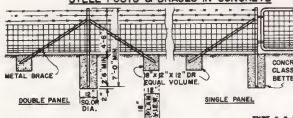
FARM ENTRANCE GATE (TYPE G-1)



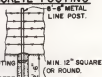
FARM ENTRANCE GATE (TYPE G-2)



STEEL POSTS & BRACES IN CONCRETE



METAL POST CONCRETE FOOTING



FOR DETAILS OF FENCE PANELS SEE
STANDARD DRAWING NO. 75

NOTE:

A DEAD MAN MAY BE A CONCRETE BLOCK, A CAST-IN-PLACE CONCRETE BLOCK, A ROCK OR OTHER APPROVED OBJECT WEIGHING AT LEAST 150 LBS. AND COVERED AT LEAST 2 FEET

NOTE: (STEEL POSTS)

EACH CORNER, END GATE, OR PULL POST AND EACH BRACE SHALL BE SET IN CONCRETE AND BRACES AS INDICATED.

USE A 18" GATE UNLESS R/W AGREEMENT STATES OTHERWISE.

ON TYPE G-2 FARM GATE, MATERIAL SHALL BE THE SAME AS NEW FENCE.

METAL LINE POSTS

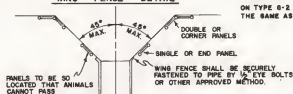
8'-0" LONG, 1.33 LBS PER FT., NOMINAL, FACTORY PAINTED OR GALVANIZED.

CORNER, GATE & END POSTS

TERMINAL POST

SHALL BE AT THE END OF ANY RUN OF WIRE OR AT ANY STRETCH PANEL.

WING FENCE DETAIL



STANDARD DRAWING

REFERENCE:
STANDARD SPEC,
SECTION 81

DWG. NO.
75

FARM FENCE

APPROVED
BY: *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION

REVISED
EFFECTIVE 3/1/72 12/20/74 4/1/79 8/1/78 6/1/79

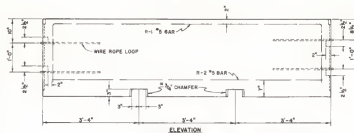








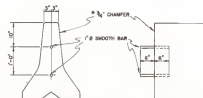
PLAN



NORMAL SECTION

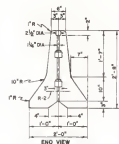


END TRANSITION DETAIL



MODIFIED END FOR BRIDGE CONNECTION

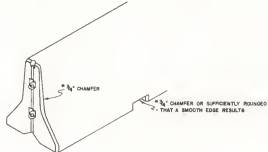
1/2" CHAMFER WILL BE ACCEPTABLE
UNLESS SECTION MAY BE BELT WITHOUT 1/2" CHAMFER



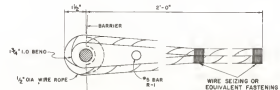
END VIEW



CONNECTING PIN DETAIL



DETAIL "A"



DETAIL "A"

NOTES

CONCRETE SHALL BE CLASS "D" OR EQUAL.

THE FINISHED SURFACE OF THE BARRIER SHALL BE SMOOTH, LEVEL, UNIFORM AND FREE FROM AIR BUBBLES, POCKETS, DEPRESSIONS AND HONEY COMB. IF THE ENGINEER DEEMS IT NECESSARY, THE BARRIER SHALL BE GIVEN A WOOD FLOAT FINISH IN ORDER TO OBTAIN THE ABOVE MENTIONED FINISH SURFACE.

REINFORCING STEEL SHALL BE MADE OF DEFORMED BARS AND SHALL CONFORM TO A 311M, A-55, OR EQL. 40.

EACH 10' SECTION SHALL BE CONNECTED WITH A 1" DIA. x 28" PIN.

THE END TRANSITION SHALL BE A CAST IN PLACE SECTION WITH TRANSVERSE JOINTS PROVIDED AT 20' CENTERS. A 1/2" OPEN JOINT EDGED WITH A 1/2" RADIUS TOOL SHALL BE USED. THE CONTRACTOR MAY CHOOSE TO USE EIGHT PRECAST SECTIONS BUT SHALL MAKE PROVISIONS FOR CONNECTING THE SECTIONS TOGETHER AND FOR LIFTING. THIS SHALL BE APPROVED IN WRITING BY THE ENGINEER.

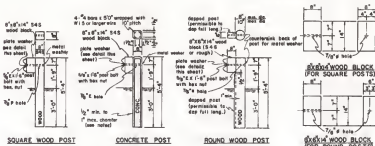
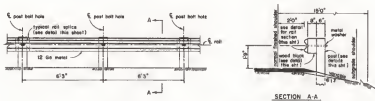
ALL EXPOSED METAL PARTS TO BE PAINTED WITH ONE COAT OF PRIMER AND TWO COATS OF ALUMINUM PAINT. METAL PARTS ARE CONSIDERED TO INCLUDE THE WIRE ROPE LOOP AND THE CONNECTING PIN. (SEE SPEC. ART. 7.02.02 (3) A-55 (1) (F)).

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE MEDIAN BARRIER RAIL. SUFFICIENT PRECAST SECTIONS SHALL BE ASSEMBLED AND Pinned IN THE FABRICATOR'S PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS SHALL BE DETERMINED EARLY IN FABRICATION.

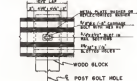
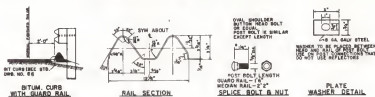
STANDARD DRAWING	
REFERENCE	DWG NO.
STANDARD SPEC.	84
SECTION	
CONCRETE	
MEDIAN RAIL	
DESIGNED	8/20/74
CHECKED	10/11/78
EFFECTIVE	8/11/78
ADMINISTRATIVE ENGINEERING DIVISION	



METAL GUARD RAIL



DETAIL OF GUARD RAIL POSTS

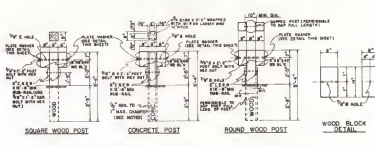
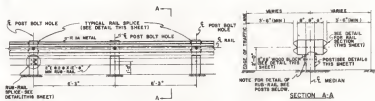


RAIL SPLICE DETAIL
(UP IN DIRECTION OF TRAFFIC)

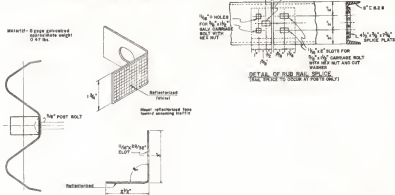
NOTES

- RAIL GALVANIZED RAIL SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A 653 OR ASTM A 653M. STEEL SHALL BE LAPPED IN DIRECTION OF TRAFFIC.
- WOOD BLOCKS SHALL HAVE NO DIMENSIONS LESS THAN 8" ON ANY SIDE AND ONLY ONE TYPE POST (SQUARE OR ROUND) TO BE USED WITH ONE REFLECTOR.
- TERMINAL SECTIONS SEE STANDARD DRAWING NO. 85 FOR APPROACH AND BRIDGE ENDS.
- BRIDGE APPROACH SEE STANDARD DRAWING NO. 86 FOR TREATMENT OF BRIDGE ENDS.
- REFLECTOR WASHER: ALL SECTIONS OF GUARD RAIL SHALL HAVE REFLECTOR WASHERS SPACED EVERY 25 FT. REFLECTOR WASHERS TO BE INCLUDED IN THE UNIT PRICE PER LINEAR FOOT OF GUARD RAIL. SEE DETAIL THIS SHEET.
- FITTINGS: ALL FITTINGS SHALL BE GALVANIZED TO CONFORM WITH STANDARD SPEC M-220 D.
- CONCRETE POSTS: ONLY ONE SIZE CHAMFER CAN BE USED IN A SINGLE RUN OF RAIL.

METAL MEDIAN RAIL



DETAIL OF GUARD RAIL POSTS



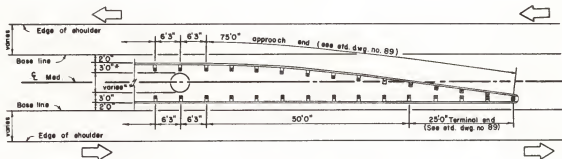
REFLECTOR-WASHER

STANDARD DRAWING	
REFERENCE:	DWG. NO. 85
SECTION NO.	
METAL GUARD AND MEDIAN RAIL	
DESIGNED BY	A. P. R. R.
APPROVED BY	APPROPRIATE AGENCIES

REVISED	DATE	BY
EFFECTIVE	3/11/72	1/1/72



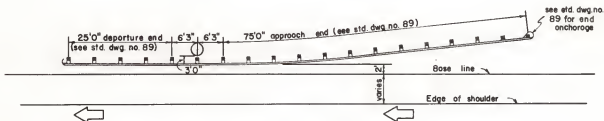




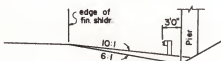
MEDIAN BRIDGE PIER TREATMENT

* This dimension may be greater if pier footings interfere with the guardrail post or if continuous rail is provided on the shoulder.

** When pier width is greater than 3'0", adjust the last eight post offsets of the 75' terminal section to fit the condition.



OUTSIDE SHLDR. BRIDGE PIER TREATMENT



OUTSIDE SHOULDER SLOPE

NOTE: Obstruction less than 30' from edge of nearest traffic lane require guardrail.

NOTE: When guardrail installations are more than 2 feet from the edge of the shoulder, the fill slope shall be a 10:1 slope beginning at the edge of finished shoulder.



MEDIAN SLOPE

STANDARD DRAWING

REFERENCE: DWG. NO. 87
STANDARD SPEC.
SECTION 90

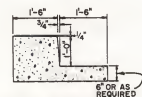
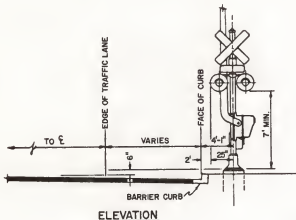
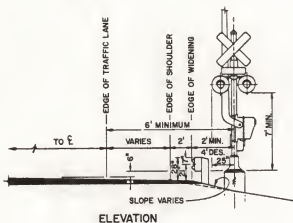
PIER TREATMENT

REVISED
EFFECTIVE 3/1/72

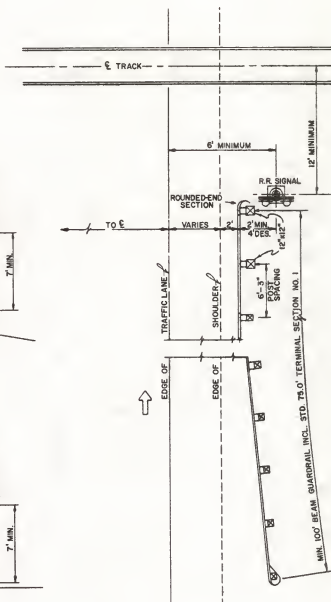
4/1/72
6/1/72

APPROVED
BY *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION





TYPICAL BARRIER CURB

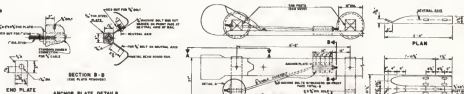
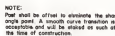


SEE BULLETIN NO. 7, "RECOMMENDED PRACTICES FOR RAILROAD-HIGHWAY GRADE CROSSING PROTECTION", ASSOCIATION OF AMERICAN RAILROADS, FOR ADDITIONAL DETAILS & SKEWED CROSSINGS.

SEE STD. DWG. NO. 89 FOR TERMINAL SECTION DETAILS.

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	88
SECTION 90	
GUARDRAIL FOR GRADE CROSSING PROTECTION	
REVISED	12/20/74 4/1/79
EFFECTIVE	3/1/72 2/1/75 6/1/79
APPROVED	
ADMINISTRATOR-ENGINEERING DIVISION	



[illegible]

The technical drawings include:

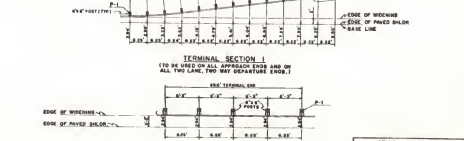
- PLAN:** A top-down view of the bridge deck showing a 10' 0" wide concrete roadway, a 10' 0" wide concrete sidewalk, and a 10' 0" wide concrete curb. It also shows a 10' 0" wide concrete median and a 10' 0" wide concrete shoulder.
- ELEVATION:** A side view of the bridge deck showing the 10' 0" wide concrete roadway, 10' 0" wide concrete sidewalk, and 10' 0" wide concrete curb. It also shows a 10' 0" wide concrete median and a 10' 0" wide concrete shoulder.
- DETAIL A:** A cross-section view of the bridge deck showing the 10' 0" wide concrete roadway, 10' 0" wide concrete sidewalk, and 10' 0" wide concrete curb. It also shows a 10' 0" wide concrete median and a 10' 0" wide concrete shoulder.

The technical drawings include:

- CABLE ASSEMBLY:** A side view of the cable assembly showing the cable, bearing plate, and various dimensions. Labels include: "FOLD & TUCK OVER BEARING PLATE", "1/2\"
- VIEW A-A:** A cross-sectional view of the cable assembly showing the internal structure and dimensions. Labels include: "1/2\"
- BEARING PLATE DETAILS:** A detailed view of the bearing plate showing its dimensions and features. Labels include: "1/2\"

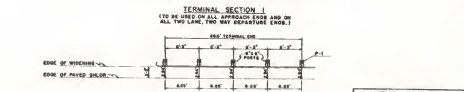


Figure 1 shows a schematic diagram of a building structure. It includes a vertical line on the left labeled 'P-1' and 'STAY POST (FT)'. A horizontal line at the top is labeled '10' and '10'.



TERMINAL SECTION 2	REFERENCE: DWD NO.
--------------------	--------------------

(10) (TO BE USED ON FOUR-LANE DIVIDED DEPARTURE ENDS)



TERMINAL SECTION 2	STANDARD DRAWING
	REFERENCE: DWG. NO.

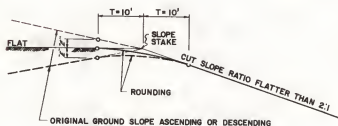
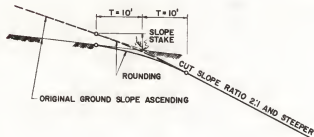
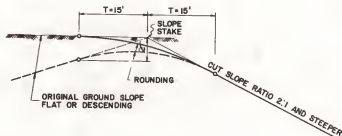
(10) (TO BE USED ON FOUR-LANE DIVIDED DEPARTURE ENDS)

STANDARD DRAWING	
REFERENCE: STANDARD SPEC. SECTION 90	QWP. NO. 00
GUARDRAIL TERMINAL SECTIONS	
APPROVED BY <i>Jack R. Rusk</i> ALTERNATE - <i>Charles E. Jones</i>	

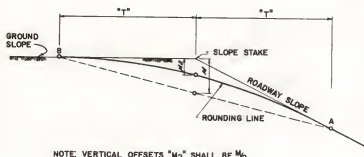








VERTICAL OFFSETS FROM ROADWAY AND GROUND SLOPES
TO ROUNDING LINES FOR CUTS



NOTE: VERTICAL OFFSETS "M₂" SHALL BE M₂

M2-C SLOPES 2:1 & STEEPER (T=15')									
DESCENDING GROUND-CUTS									
VERT. DIST. "E" (FT.)	M2=M ₂ (FT.)								
	3/4:1	1:1	1 1/4:1	1 1/2:1	1 3/4:1	2:1			
FLAT	5.0	3.6	3.0	2.5	2.2	1.9			
2.0	5.5	4.3	3.5	3.0	2.7	2.4			
4.0	6.0	4.8	4.0	3.5	3.2	2.9			
6.0	6.5	5.3	4.5	4.0	3.7	3.4			
8.0	7.0	5.8	5.0	4.5	4.2	3.9			
10.0	7.5	6.3	5.5	5.0	4.7	4.4			
12.0	8.0	6.8	6.0	5.5	5.2	4.9			
14.0	8.5	7.3	6.5	6.0	5.7	5.4			
16.0	9.0	7.8	7.0	6.5	6.2	5.9			

M2-C SLOPES 2:1 & STEEPER (T=10')									
ASCENDING GROUND-CUTS									
VERT. DIST. "E" (FT.)	M2=M ₂ (FT.)								
	3/4:1	1:1	1 1/4:1	1 1/2:1	1 3/4:1	2:1			
1.0	3.4	2.5	2.0	1.7	1.4	1.3			
2.0	2.9	2.0	1.5	1.2	0.9	0.8			
4.0	2.4	1.5	1.0	0.7	0.4	0.3			
6.0	1.0	1.0	0.5	0.2	0.0	0.0			
8.0	1.4	0.5	0.0	0.0					
10.0	0.9	0.0							
12.0	0.4								
14.0	0.0								

M2 FOR CUT SLOPES FLATTER THAN 2:1 (T=10')									
DESCENDING GROUND-CUTS									
VERT. DIST. "E" (FT.)	M2=M ₂ (FT.)								
	2 1/2:1	3:1	3 1/2:1	4:1	5:1	6:1			
FLAT	1.0	0.8	0.7	0.6	0.5	0.4			
1.0	1.3	1.1	1.0	0.9	0.8	0.7			
2.0	1.5	1.3	1.2	1.1	1.0	0.9			
3.0	1.8	1.6	1.5	1.4	1.3	1.2			
4.0	2.0	1.8	1.7	1.6	1.5	1.4			
5.0	2.3	2.1	2.0	1.9	1.8	1.7			
6.0	2.5	2.3	2.2	2.1	2.0	1.9			
7.0	2.8	2.6	2.5	2.4	2.3	2.2			
8.0	3.0	2.8	2.7	2.6	2.5	2.4			
9.0	3.3	3.1	3.0	2.9	2.8	2.7			
10.0	3.5	3.3	3.2	3.1	3.0	2.9			

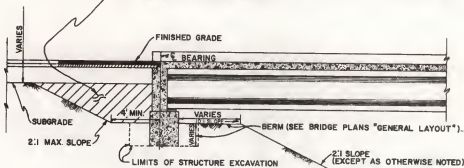
M2 FOR CUT SLOPES FLATTER THAN 2:1 (T=10')									
ASCENDING GROUND-CUTS									
VERT. DIST. "E" (FT.)	M2=M ₂ (FT.)								
	2 1/2:1	3:1	3 1/2:1	4:1	5:1	6:1			
FLAT	1.0	0.8	0.7	0.6	0.5	0.4			
1.0	0.8	0.6	0.5	0.4	0.3	0.2			
2.0	0.5	0.3	0.2	0.1	0.0	0.0			
3.0	0.3	0.0	0.0	0.0					
4.0	0.0								
5.0									
6.0									
7.0									
8.0									
9.0									
10.0									

STANDARD DRAWING		
REFERENCE:	STANDARD SPEC.	DWG. NO. 100
SECTION II		
SLOPE ROUNDING		
APPROVED	APPROVED	
ADMINISTRATOR-ENGINEERING DIVISION	ADMINISTRATOR-ENGINEERING DIVISION	

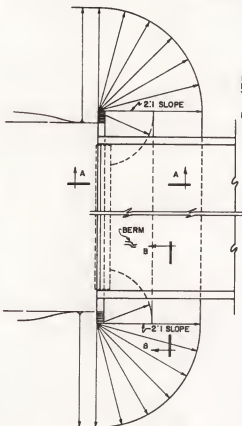
REVISED	
EFFECTIVE	3/1/72



THE GRADING CONTRACTOR SHALL NOT PLACE THIS PORTION OF THE ROADWAY EMBANKMENT UNTIL AFTER THE BRIDGE CONTRACTOR HAS COMPLETED THE BACKWALL AND DECK SLAB. ALL MATERIAL SHALL BE LAYER PLACED AND COMPACTED IN ACCORDANCE WITH ARTICLE 11.04 (B) OF THE STANDARD SPECS.

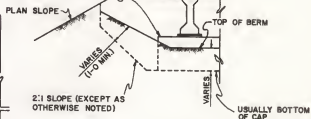


SECTION A-A



PLAN VIEW AT FINISHED BRIDGE END

NOTE: FILL MATERIAL MUST BE KEPT OFF THE TOP OF THE CONCRETE CAP



VIEW B-B
AT FINISHED BRIDGE END

STANDARD DRAWING

REFERENCE: DWG. NO. 101
STANDARD SPEC.
SECTION 11

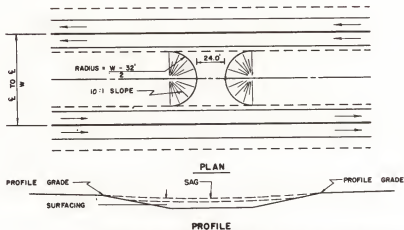
ROADWAY EMBANKMENT
AT BRIDGE END

REVISED
EFFECTIVE 3/11/72

APPROVED
BY *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

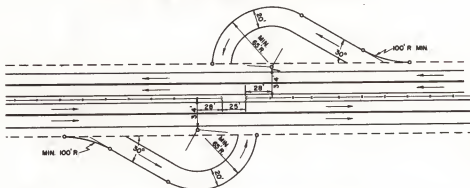


MEDIAN WIDTHS 36' TO 76'



NOTE: Turnouts above to be located and constructed in conjunction with ditch blocks if at all possible. Drainage shall be provided when necessary.

STANDARD U-TURN FOR NARROW MEDIANS



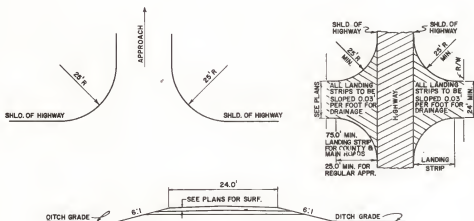
NOTES:

Narrow medians, median widths greater than 76 ft and independent roadways require special design.
 GRADES: Uniform between inside shoulders of main traveled way except for special design.
 SURFACING: See plans for quantities.
 DRAINAGE: Use 18" or 24" culverts if required.

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	102
SECTION II	
U-TURN MEDIAN OPENINGS ON CONTROLLED ACCESS HIGHWAYS	
APPROVED	
BY <i>[Signature]</i>	
ADMINISTRATOR-ENGINEERING DIVISION	

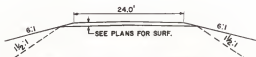
REVISED	
EFFECTIVE	3/1/72





TYPICAL SECTION AT 25' DITCH LINE

FOR DRAINAGE-PIPE AS NECESSARY



TYPICAL SECTION IN THOROUGH FILL
USE 6:1 SLOPE FOR FILLS OF 5' OR LESS

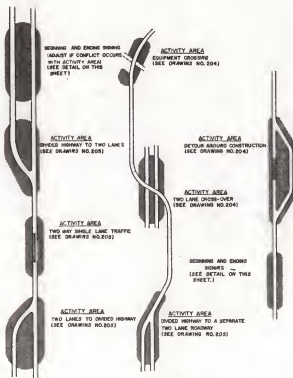
GRADE OF APPROACH NOT TO EXCEED 10% UNLESS TRAFFIC VOLUME AND COST INDICATE SUCH TO BE JUSTIFIABLE.

APPROACHES TO BE CONSTRUCTED TO FIT LOCAL CONDITIONS, BUT IN SUCH MANNER AS TO MINIMIZE TRAFFIC HAZARD AND AFFORD SAFE AND COMMODIOUS ENTRY AND EXIT OF TRAFFIC TO AND FROM MAIN ROAD.

WHERE IT BECOMES NECESSARY TO GO BEYOND RIGHT-OF-WAY LINES, WRITTEN PERMISSION SHALL BE SECURED FROM PROPERTY OWNER IN ALL INSTANCES.

STANDARD DRAWING	
REFERENCE:	DWG. NO.
STANDARD SPEC.	103
SECTION 20	
APPROACHES	
REVISED	APPROVED:
EFFECTIVE 3/11/72	<i>[Signature]</i>
	ADMINISTRATOR-ENGINEERING DIVISION

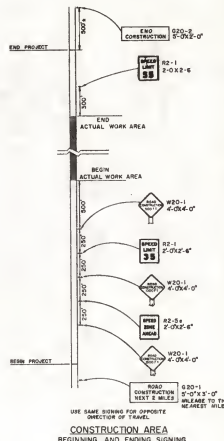




PLAN OF TYPICAL CONSTRUCTION AREAS

GENERAL NOTES

- NO CONSTRUCTION SHALL COMMENCE ON THE PROJECT UNTIL NECESSARY CONSTRUCTION WARNING SIGNS, DEVICES AND BARRIERS ARE IN PLACE AND APPROVED BY THE ENGINEER.
- ALL SIGNS AND BARRIERS REQUIRED FOR A CONSTRUCTION PROJECT (EXCEPT AS NOTED) SHALL BE TOWNEED AND INSTALLED BY THE CONTRACTOR.
- THE 800'-S SIGN SHALL BE USED IF PROJECT LENGTH IS TWO MILES OR MORE, BUT MAY BE DELETED ON SHORT PROJECTS. ROUTE 800-1 AND 800-2 AT OR NEAR BEGIN OR END OF PROJECT SO THAT THEY WILL NOT INTERFERE WITH THE ACTUAL CONSTRUCTION AREA.
- ALL SPURRING AND TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, LATEST EDITION, PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION.
- ALL SIGN LOCATIONS ARE APPROXIMATE AND SHOULD BE ADJUSTED TO FIT FIELD CONDITIONS.
- DELIMITATION SPACING FOR TWO LANE AND FOUR LANE ROAD APPROACHING CONSTRUCTION AREAS AND SPACING THROUGH CONSTRUCTION AREAS SHALL BE ACCORDING TO SIGNING STANDARD NUMBERED 203. SPACING MAY BE REDUCED AS INDICATED BY FIELD CONDITIONS.
- EXISTING ROADWAY IMPROVEMENTS SHALL BE ORIGINATED WHERE THEY COMPLY WITH TRAFFIC MOVEMENT THROUGH CONSTRUCTION AND DETOUR AREAS.
- THE APPROPRIATE SIGNING STANDARD TO BE USED FOR A PARTICULAR WORK AREA SHALL BE DETERMINED BY THE ENGINEER.
- DESIGN DETAILS OF SIGNS ARE FOUND IN THE FEDERAL HIGHWAY ADMINISTRATION MANUAL "STANDARD NUMBER 203, LATEST EDITION. SIGNS LARGER THAN THOSE DETAILED SHALL BE INCREASED IN SIZE PROPORTIONATELY.
- THESE CONSTRUCTION SIGNING STANDARDS ARE TO BE USED AS A MINIMUM GUIDE FOR TYPICAL MAJOR CONSTRUCTION OPERATIONS. REDUCED SIGNING REQUIREMENTS MAY BE PERMISSIBLE FOR SHORT PROJECTS AND CONSTRUCTION OPERATIONS WITHIN THE LIMITS OF A MAJOR WORK AREA. SEE PARAGRAPH 803-2 OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.



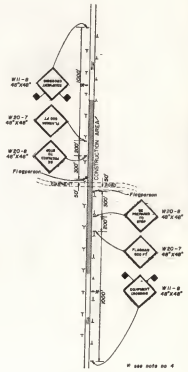
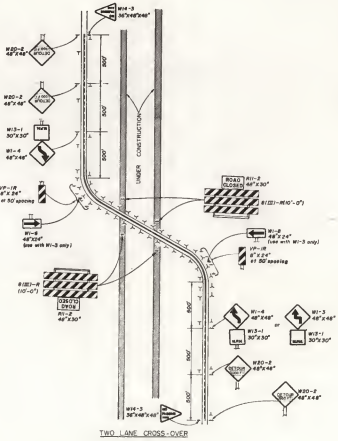
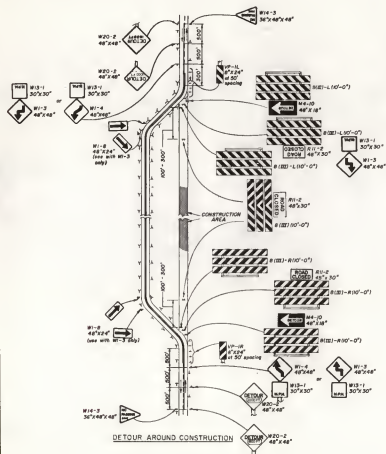
CONSTRUCTION AREA BEGINNING AND ENDING SIGNING

STANDARD DRAWING		
REFERENCE	ONE NO.	
STANDARD SPEC.	203	
SECTION NAME		
CONSTRUCTION SIGNING STANDARDS		

REVISED 12/199 1-1/80/91
EFFECTIVE 4/1/91 4/20/91

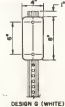
100% L





- NOTES:**
- W13 signs shall be used only when design speed of curves is 30 mph or less.
 - Flower delivery 36" wide or greater shall have 4" utility shoulder stripes.
 - Where construction shall be unopened additional delineation may be added.
 - W20-7 (1000') shall be used as needed to assist with heavy traffic volumes.

DELINEATOR LEGEND
1. 30" x 30"
2. 30" x 30"
3. 30" x 30"

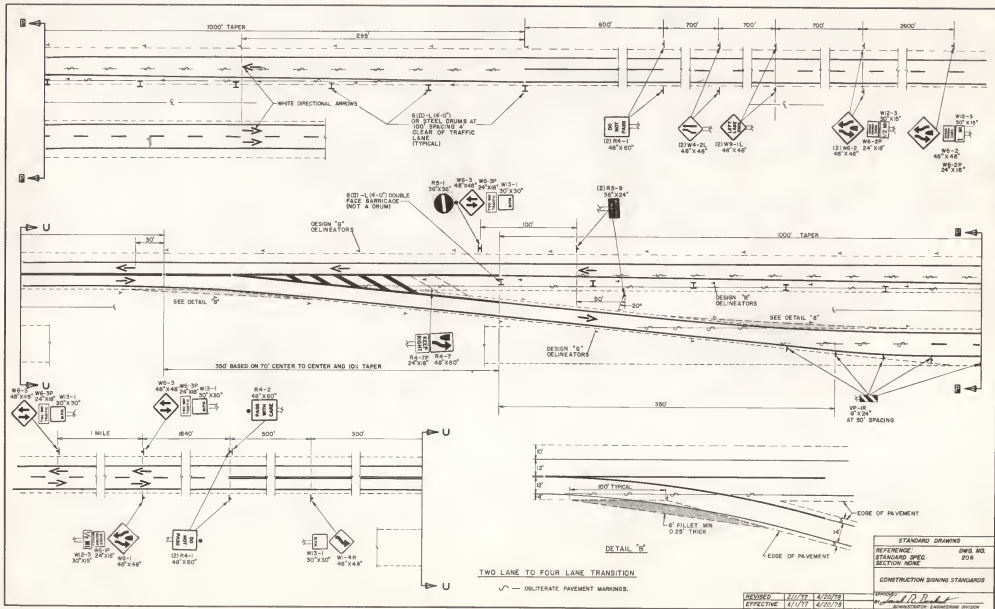


REVISED 3/1/77 4/15/79
EFFECTIVE 4/1/77 4/15/79

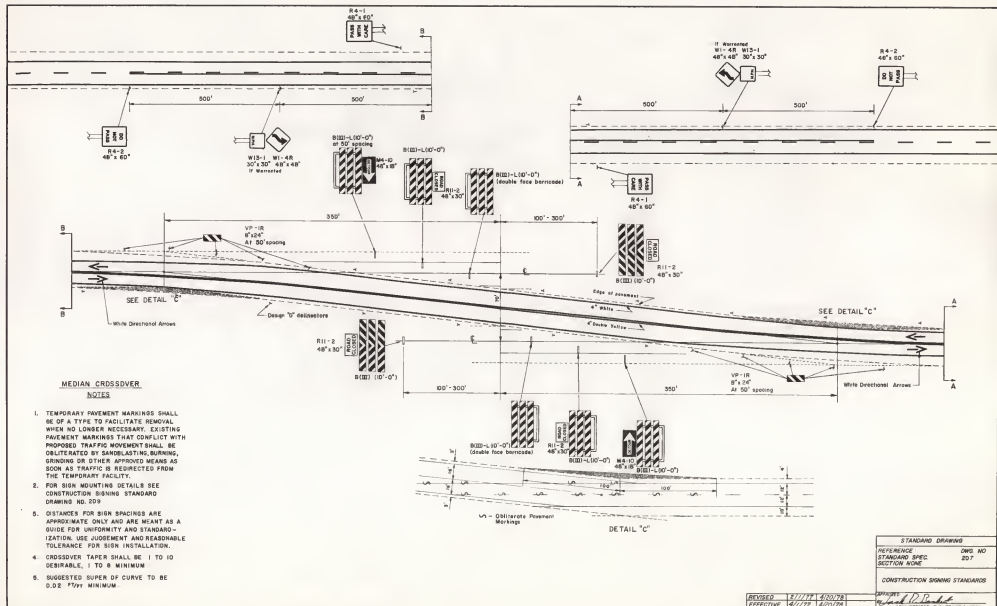
STANDARD DYNAMIC
REFERENCE: 204
STANDARD SPEC: 204
ELUTION HOME
CONSTRUCTION SIGNING STANDARDS









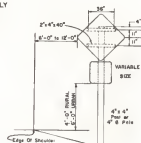
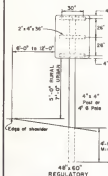


STANDARD DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	207
SECTION NONE	
CONSTRUCTION SIGNING STANDARDS	
APPROVED <i>Jack P. B. [Signature]</i>	

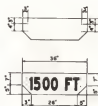




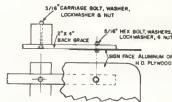
FOR CONSTRUCTION
SIGNING ONLY



W20-1
48" x 48"



36" x 48" Sheet steel plate with black legend as indicated on sign background. See FHWA Standard Highway Signs Manual for details of distance legends and construction signs. Attach with 6 metal screws.

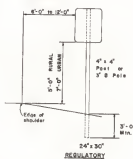


SIGN FASTENING AND
BACK BRACE DETAILS

NOTE

Distance plates may be made for 500ft, 1000ft, and 1500ft and be attached to any of the following signs:

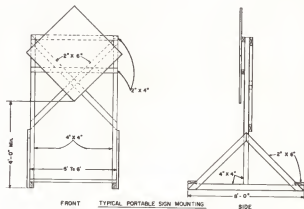
- W11 - 2 ROAD CLOSED
- W20 - 4 ONE LANE ROAD
- W20 - 5 RIGHT LANE CLOSED
- W20 - 7 FLAGMAN



24" x 30"
REGULATORY

NOTES

- Lengths of posts or poles shall be determined by the engineer when construction stakes are set.
- Posts and poles shall be drilled for breakaway if larger poles are required due to high wind areas. (see old spec 228)
- Round posts shall require a 2"x4"x12" cleat to be nailed (use two 16d 12" from the bottom of each pole.



FRONT TYPICAL PORTABLE SIGN MOUNTING

SIDE

TYPICAL SIGN MOUNTING

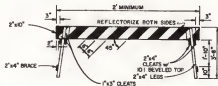
CONSTRUCTION SIGN DETAILS

REVISED 7/77 12/77 4/78 7/78
EFFECTIVE 8/77 12/77 4/78 7/78

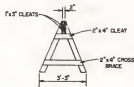
STANDARD DRAWING
REFERENCE DWS NO 204
SECTION NONE
CONSTRUCTION SIGNING STANDARDS--
DIRECTION AND SIGN DETAILS
DESIGNED BY R. R. Rucker
DESIGNED BY R. R. Rucker



B(I)-R

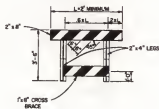


FRONT VIEW

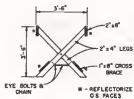


SIDE VIEW

B(II)-R



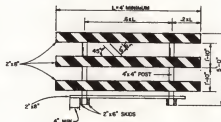
FRONT VIEW



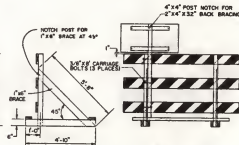
SIDE VIEW

ALTERNATE CONSTRUCTION

B(III)-L



FRONT VIEW

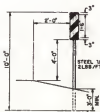


REAR VIEW

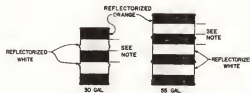
NOTES:

BARRICADES

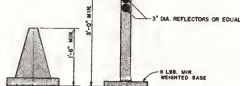
1. ALL BARRICADES SHALL HAVE ALTERNATING REFLECTIVE ORANGE AND WHITE STRIPES, 6" IN WIDTH AT AN ANGLE OF 45° AS SHOWN. THE STRIPES SHALL SLOPE DOWNWARD TOWARD THE SIDE TRAFFIC IS TO PASS. BOTH FRONT AND BACK SHALL BE LESS THAN THREE FEET LONG BUT HAVE 6 INCH WIDE STRIPES.
2. ALL BARRICADES SHALL BE REFLECTORIZED WITH ORANGE AND WHITE SHEETINGS MOUNTED ON A SHEET ALUMINUM BACKING AT LEAST 1/4" THICK. THESE ALUMINUM ALLOY SHEETINGS CONFORMING TO A.S.T.M. SPECIFICATION B-223 SHALL BE USED. THIS REFLECTIVE ALUMINUM SHEETING SHALL BE SECURED WITH ALUMINUM NAILS.
3. BARRICADES, INCLUDING FRAMEWORK, SHALL BE PAINTED WITH 2 COATS OF WHITE PRIMA ACCORDING TO SECTION B-102.02, (A.S.T.M. STANDARD SPECIFICATIONS).
4. BARRICADES OF SUFFICIENT WEIGHT SHALL BE USED TO HOLD BARRICADE IN PLACE.
5. BARRICADES SHALL BE CONSTRUCTED OF STANDARD GRADE NO. 1 OR BETTER 848 LUMBER. USE 848 LUMBER BOLTS FOR ALL CONNECTIONS.
6. WHERE RISE BARRICADES ARE TO FACE TRAFFIC FROM TWO DIRECTIONS, STRUTS ON THE FRONT AND REAR SIDES WILL BE REQUIRED.
7. BARRICADES ON VERTICAL PANELS DEMONSTRATED "A" SHALL BE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC.
8. FLEXIBLE RUBBER POST REFLECTORS SHALL MATCH THE COLOR OF THE ADJACENT LANE LINE.
9. APPROVED PLASTIC PIPE MAY BE USED FOR BARRICADES.



VERTICAL PANEL



DRUMS



CONES FLEXIBLE GUIDE POST

FOR NOT TO EXCEED 1/4" OF DUAL WITH SAND TO HOLD SAND TIGHTLY AND IN PLACE. THERE SHALL BE AT LEAST THREE ORANGE AND TWO WHITE STRIPES ON EACH DRUM STRIPES MAY VARY FROM 4 TO 8 INCHES IN WIDTH.

FLUORESCENT ORANGE STANDARD DESIGN

FLUORESCENT ORANGE AS APPROVED BY PROJECT MANAGER

STANDARD DRAWING	DWG. NO.
REFERENCE: STANDARD SPEC. SECTION 800	210
CONSTRUCTION SHOWING STANDARDS - BARRICADES	
DATE: 1/1/77	BY: D.B.R.
REVISION: 1/1/77	APPROVED: [Signature]
EFFECTIVE: 4/1/77	ADMINISTRATOR - CALIFORNIA DIVISION

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

[illegible]

[Faint handwritten notes]

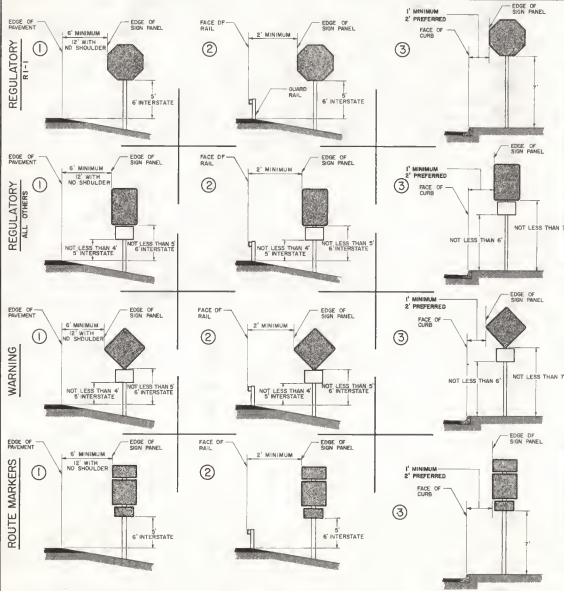
111

REGULATORY R1-1

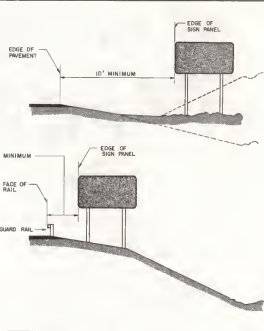
REGULATORY ALL OTHERS

WARNING

ROUTE MARKERS



GUIDE SIGNS



NOTES

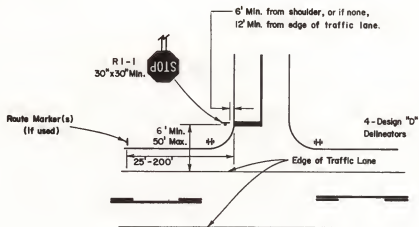
- Information contained herein is the recommended clearances and mounting heights that shall be used when placing all signs.
- For Regulatory, Warning, and Route Marker Signs, and their assemblies, on highways other than interstates:
 - diagrams located in column ① shall be used when placing these signs in standard RURAL conditions, column ② shall be used when placing these signs behind Guard Rail in RURAL conditions, column ③ shall be used when placing these signs in URBAN conditions where there is adequate clearance and adequate width.
 - where network width is limited in URBAN conditions, see Signing Standard Drawing No. 227 for placement details.
- For Regulatory (All Others), Warning, and Route Marker Signs, and their assemblies, on interstates highways:
 - the clearance should be 20' from edge of pavement in column ① for standard RURAL conditions. The clearance listed in columns ② and ③ shall remain as shown.
- For Guide Signs, and their assemblies:
 - the diagrams located above shall be used when placing these signs in the given RURAL conditions.
 - for placement of these signs in URBAN conditions, see the Sign Location and Specification Sheets in the Signing Plans for each individual sign.
 - the minimum clearance of these signs shall not exceed 35' in any condition.
 - see Standard Drawing No. 222 for mounting heights.

| | |
|--|------------------------|
| APPROVED | BY: <i>[Signature]</i> |
| ADMINISTRATOR - ENGINEERING DIVISION | |
| SIGNING | |
| STANDARD DRAWING NO. 215 | |
| STATE OF MONTANA | |
| DEPARTMENT OF HIGHWAYS | |
| TYPICAL SIGN CLEARANCES AND MOUNTING HEIGHTS | |

REVISED 10/8/76 4/1/79
EFFECTIVE 2/1/78 6/1/79

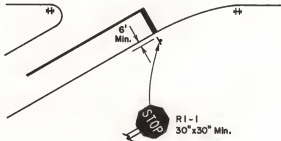


TYPICAL APPROACH ROAD SIGNING

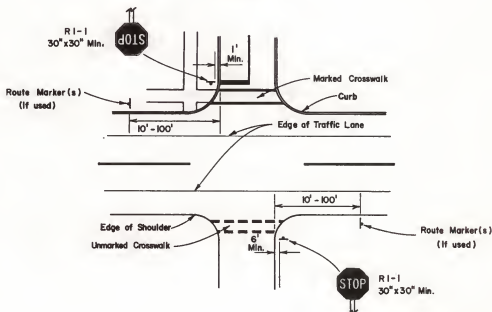


NOTE:

Place R1-1 Sign at the beginning of curb radius, or shoulder radius, or 4 feet min. in advance of the marked or unmarked Crosswalk.



RURAL



URBAN

SIGNING STANDARD
DRAWING NUMBER 216

TYPICAL
RURAL AND URBAN
APPROACH

REVISED 4/1/79
EFFECTIVE 6/1/79

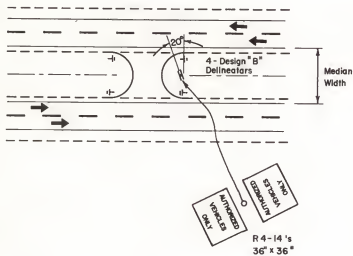
APPROVED BY *[Signature]*
SIGNING ENGINEER - ENGINEERING DIVISION



MEDIAN U-TURN SIGNING

NOTES:

1. For Median Widths of 76 feet or less, the R4-14 Signs shall be mounted back to back. They shall be placed at the centerline of the Median and on the side of the U-Turn away from the nearest interchange.
2. For Median Widths greater than 76 feet, the R4-14 signs shall be installed separately on both sides of the U-Turn at clearances specified in the Sign Location and Specifications.
3. For openings through Median Guard Rails, the sign post shall be placed in line with the Guard Rail Posts.



SIGNING STANDARD
DRAWING NUMBER 217

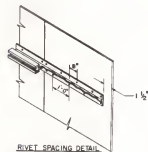
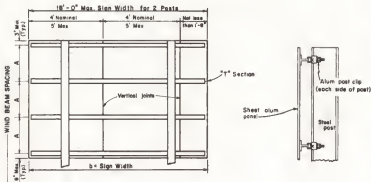
MEDIAN U-TURN SIGNING

| | | | |
|-----------|--------|--|--|
| REVISED | 2/1/79 | | |
| EFFECTIVE | 6/1/79 | | |

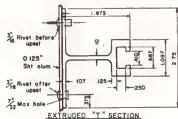
| | |
|----------|------------------------------------|
| APPROVED | |
| BY | ADMINISTRATOR-ENGINEERING DIVISION |



ALUMINUM SHEET INCREMENT GUIDE SIGN DETAILS



NOTE:
Rivets at 6" alternate centers on horizontal extruded T-section.
Rivets doubled (both sides of extruded T-section) at horizontal and vertical joints in sheet aluminum frame and at ends of extruded T-section.



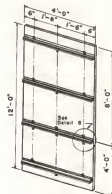
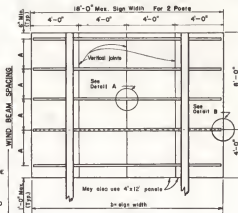
NOTES GENERAL

ALL HORIZONTAL JOINTS SHALL OCCUR AT A "T" SECTION.
NO SPLICES ARE ALLOWED IN EXTRUDED "T" SECTIONS.
ALL SCREWS, BOLTS, AND LOCKWASHERS SHALL BE OF ALUMINUM ALLOY, STAINLESS STEEL, OR CADMIUM PLATED STEEL.
ONLY ALUMINUM RIVETS SHALL BE USED.

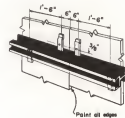
NOTES
ALUMINUM SIGNS
1. ALL ALUMINUM SIGNS SHALL CONFORM TO SECTION 89, ART. M-380.01 (B) & M-380.02 (B) OF THE STANDARD SPECIFICATIONS.
2. SIGNS LESS THAN 4'-0" HIGH AND 4'-0" LONG SHALL BE MADE OF A SINGLE SHEET OF ALUMINUM.
3. SIGNS UP TO, AND INCLUDING, 6'-0" HIGH SHALL HAVE NO HORIZONTAL JOINTS, AND NO SHEET SHALL BE LESS THAN 1'-8" WIDE.
4. SIGNS OVER 6'-0" HIGH MAY HAVE HORIZONTAL AND VERTICAL JOINTS, HOWEVER, NO SHEET SHALL BE LESS THAN 1'-8" WIDE OR 1'-6" HIGH.
5. TIGHTEN POST CLIP NUTS TO 225 IN/LB TORQUE USING DRY, CLEAN THREADS.

PLYWOOD SIGNS
1. ALL PLYWOOD SIGNS SHALL CONFORM TO SECTION 89, ART. M-380.01 (C) & M-380.02 (B) OF THE STANDARD SPECIFICATIONS.
2. SIGNS 4'-0" HIGH OR GREATER SHALL HAVE NO PANEL LESS THAN 4'-0" IN HEIGHT.
3. SIGNS UNDER 4'-0" HIGH SHALL NOT HAVE HORIZONTAL JOINTS.
4. SIGNS WITH WIDTHS THAT ARE NOT IN MULTIPLES OF 4'-0" SHALL HAVE ONE PANEL ON INSIDE EDGE.
5. FOR SIGNS OVER 10'-0" IN HEIGHT, THE FULL HEIGHT MAY BE OBTAINED WITH PANELS HAVING A FACTORY SCARFED JOINT IN LIEU OF USING STANDARD LENGTH PANEL AS SHOWN.
6. NO HORIZONTAL PANEL SHALL BE SMALLER THAN 1'-8" WIDE BY 4'-0" HIGH.

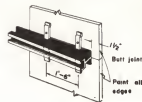
PLYWOOD SHEET INCREMENT GUIDE SIGN DETAILS



DETAIL OF ALUM. CLIP PLACEMENT



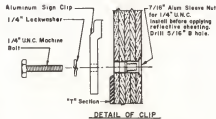
DETAIL A (Vertical joint)



DETAIL B (Horizontal joint)

| WIND BEAM CHART (PLYWOOD) | | | |
|---------------------------|-------------------|--------|--------|
| WIND BEAM SPACING "T" | MAXIMUM WIDTH (b) | 2 POST | 3 POST |
| 1'-0" | 19'-0" | 23'-0" | 29'-0" |
| 1'-6" | 16'-0" | 20'-0" | 26'-0" |
| 2'-0" | 13'-0" | 17'-0" | 23'-0" |
| 2'-6" | 10'-0" | 14'-0" | 20'-0" |
| 3'-0" | 7'-0" | 11'-0" | 17'-0" |

| WIND BEAM CHART (ALUMINUM) | | | |
|----------------------------|-------------------|--------|--------|
| WIND BEAM SPACING "T" | MAXIMUM WIDTH (b) | 2 POST | 3 POST |
| 1'-0" | 16'-0" | 20'-0" | 26'-0" |
| 1'-6" | 13'-0" | 17'-0" | 23'-0" |
| 2'-0" | 10'-0" | 14'-0" | 20'-0" |

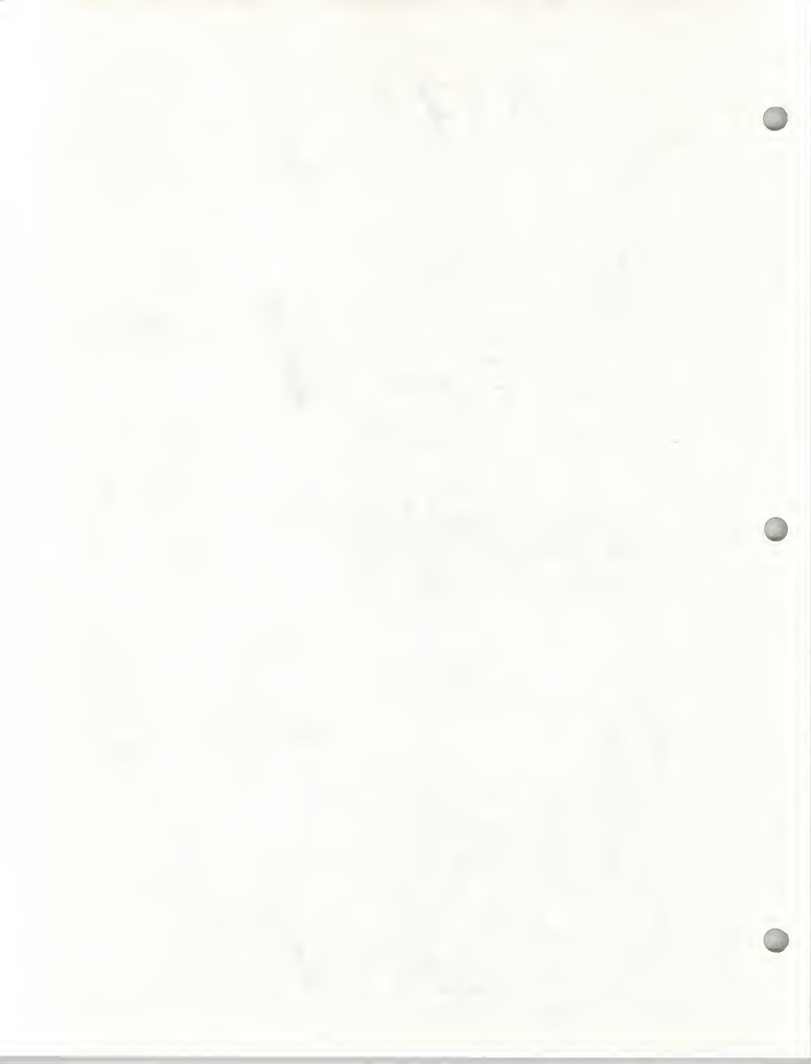


DETAIL OF CLIP

REVISED 10/8/76
EFFECTIVE 2/1/78

APPROVED BY: *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION
SIGNING
STANDARD DRAWING NO. 219

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
GENERAL GUIDE SIGN
CONSTRUCTION DETAILS





PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. Assemble post to stub with bolts and one flat washer between plates.
2. Shim as required to plumb post.
3. Tighten bolts in a systematic order to the prescribed torque.
4. Loosen each bolt and retighten to prescribed torque in this same order as original tightening.
5. Durc threads at junction with nut using a center punch to prevent nut loosening.

BASE CONNECTION DATA

| POST SIZE | BOLT SIZE | HEIGHT OF POST | HEIGHT OF BASE | HEIGHT OF PLATE | HEIGHT OF SHIM | HEIGHT OF TOTAL |
|-----------|-----------|----------------|----------------|-----------------|----------------|-----------------|
| W4 x 13 | 3/8" | 13 | 13 | 13 | 13 | 52 |
| W6 x 15 | 3/8" | 15 | 15 | 15 | 15 | 60 |
| W8 x 17 | 3/8" | 17 | 17 | 17 | 17 | 68 |
| W10 x 24 | 3/8" | 24 | 24 | 24 | 24 | 96 |
| W12 x 27 | 3/8" | 27 | 27 | 27 | 27 | 108 |
| W14 x 30 | 3/8" | 30 | 30 | 30 | 30 | 120 |
| W16 x 36 | 3/8" | 36 | 36 | 36 | 36 | 144 |
| W18 x 40 | 3/8" | 40 | 40 | 40 | 40 | 160 |
| W20 x 44 | 3/8" | 44 | 44 | 44 | 44 | 176 |
| W24 x 55 | 3/8" | 55 | 55 | 55 | 55 | 220 |

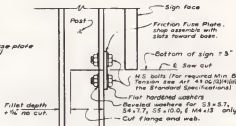
FUSE PLATE DATA

| POST SIZE | BOLT SIZE | HEIGHT OF POST | HEIGHT OF BASE | HEIGHT OF PLATE | HEIGHT OF SHIM | HEIGHT OF TOTAL |
|-----------|-----------|----------------|----------------|-----------------|----------------|-----------------|
| W4 x 13 | 3/8" | 13 | 13 | 13 | 13 | 52 |
| W6 x 15 | 3/8" | 15 | 15 | 15 | 15 | 60 |
| W8 x 17 | 3/8" | 17 | 17 | 17 | 17 | 68 |
| W10 x 24 | 3/8" | 24 | 24 | 24 | 24 | 96 |
| W12 x 27 | 3/8" | 27 | 27 | 27 | 27 | 108 |
| W14 x 30 | 3/8" | 30 | 30 | 30 | 30 | 120 |
| W16 x 36 | 3/8" | 36 | 36 | 36 | 36 | 144 |
| W18 x 40 | 3/8" | 40 | 40 | 40 | 40 | 160 |
| W20 x 44 | 3/8" | 44 | 44 | 44 | 44 | 176 |
| W24 x 55 | 3/8" | 55 | 55 | 55 | 55 | 220 |

FOUNDATION DATA

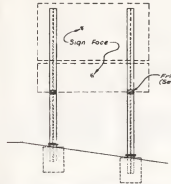
| POST SIZE | BOLT SIZE | HEIGHT OF POST | HEIGHT OF BASE | HEIGHT OF PLATE | HEIGHT OF SHIM | HEIGHT OF TOTAL |
|-----------|-----------|----------------|----------------|-----------------|----------------|-----------------|
| W4 x 13 | 3/8" | 13 | 13 | 13 | 13 | 52 |
| W6 x 15 | 3/8" | 15 | 15 | 15 | 15 | 60 |
| W8 x 17 | 3/8" | 17 | 17 | 17 | 17 | 68 |
| W10 x 24 | 3/8" | 24 | 24 | 24 | 24 | 96 |
| W12 x 27 | 3/8" | 27 | 27 | 27 | 27 | 108 |
| W14 x 30 | 3/8" | 30 | 30 | 30 | 30 | 120 |
| W16 x 36 | 3/8" | 36 | 36 | 36 | 36 | 144 |
| W18 x 40 | 3/8" | 40 | 40 | 40 | 40 | 160 |
| W20 x 44 | 3/8" | 44 | 44 | 44 | 44 | 176 |
| W24 x 55 | 3/8" | 55 | 55 | 55 | 55 | 220 |

FRICTION FUSE PLATE DETAIL



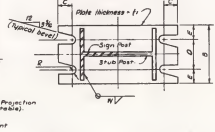
Note: All MS bolts shall be ASTM A-325

TYPICAL SIGN ELEVATION



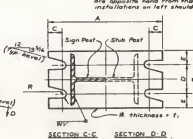
SECTION A-A

© SIGN POST AND STUB POST DETAIL "A" (POST SPRING GREATER THAN 4'-2")



SECTION B-B

Note: Sections shown are for installations on right shoulder and in gore. Plate stub ends are opposite hand from that shown for installations on left shoulder.

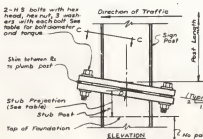
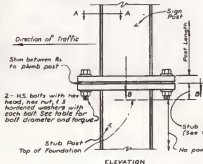


SECTION C-C

SECTION D-D

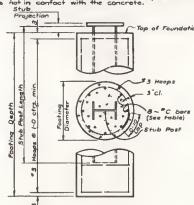
SIGN POST AND STUB POST DETAIL "B" (POST SPRING 4'-2" OR LESS)

Note: Friction fuse plates are not required with this detail.



FRICTION FUSE PLATE DETAIL

PAINT - Except as otherwise approved by the Engineer, Structural Steel shall receive one (1) shop coat and one (1) field coat of red lead or basic lead; Silico-Chrome and one (1) field coat of aluminum paint as specified in the Standard Specifications on all surfaces not in contact with the concrete.



FOUNDATION DETAIL

| | | |
|-----------|----------|--------|
| REVISION | 10/17/76 | 6/1/79 |
| EFFECTIVE | 2/1/75 | 6/1/79 |

APPROVED *[Signature]*
SUPERVISOR - BRIDGE SECT.

SHIM DETAIL

Shims are cast in place. Shims shall be fabricated from steel shop stock or strip conforming to ASTM A-36.

NOTES

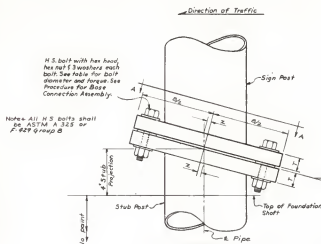
SPECIFICATIONS: Montana State Highway Commission Standard Specifications for Road and Bridge Construction, and any amendments thereto, and Special Provisions shall govern unless otherwise noted. **CLASPS:** Posts and fastenings prepared in accordance with Exhibit C Standard Specifications for Structures on Supports for Highway Signs, Luminaires and Traffic Signals. **1973 Edition.** **CONCRETE:** Concrete shall be Class A or D per ACI 308. **STEEL:** Steel shall be A36 or A572. **PAINT:** The unit price bid for paint for steel posts shall be bid based on the total weight of steel posts including all coats, including three, shop and field coats, plus the weight of the paint. The weight of the paint shall be based on the weight of the steel. **GUIDE SIGNS:** For Guide Sign placement and details, see Signing Standard Drawing No. 220.

APPROVED *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

STANDARD DRAWING NO. 223

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
BREAK-AWAY & FOUNDATION DETAILS
FOR MULTIPLE GUIDE SIGN SUPPORTS
BRIDGE DIVISION NO. 24-2





SIGN POST AND STUB POST DETAILS

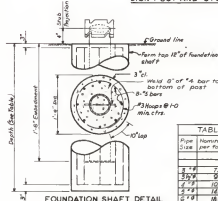


TABLE OF WEIGHTS

| Pipe | Nominal weight
per foot of pipe | Weight of sign
post per foot of pipe |
|-------|------------------------------------|---|
| 2" #1 | 7.50 | 28.00 |
| 3" #1 | 10.75 | 31.00 |
| 4" #1 | 16.00 | 37.50 |
| 5" #1 | 21.00 | 44.00 |
| 6" #1 | 26.00 | 50.50 |

| BASE CONNECTION DATA | | FOUNDATION | | | | | | | | | |
|----------------------|---------------|------------|--------|-------|-------|-------|-------|-------|-------|----------------------|-------------------|
| Nominal
Pipe Size | Base
Size | A | B | C | D | E | F | T | X | Footings
Diameter | Footings
Depth |
| 2" #1 | 1/2" x 2 1/2" | 4" #1 | 7" #1 | 2" #1 | 2" #1 | 2" #1 | 2" #1 | 2" #1 | 2" #1 | 1-6 | 3-0 |
| 3" #1 | 1/2" x 3 1/2" | 5" #1 | 8" #1 | 3" #1 | 3" #1 | 3" #1 | 3" #1 | 3" #1 | 3" #1 | 1-6 | 3-0 |
| 4" #1 | 1/2" x 4 1/2" | 6" #1 | 9" #1 | 4" #1 | 4" #1 | 4" #1 | 4" #1 | 4" #1 | 4" #1 | 1-6 | 4-0 |
| 5" #1 | 1/2" x 5 1/2" | 7" #1 | 10" #1 | 5" #1 | 5" #1 | 5" #1 | 5" #1 | 5" #1 | 5" #1 | 1-6 | 4-6 |

NOTES
SPECIFICATIONS: Montana State Highway Commission Standard Specifications for Road and Bridge Construction, and amendments thereto, and Special Provisions shall govern unless otherwise noted. Design of posts and footings prepared in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1975 Edition.

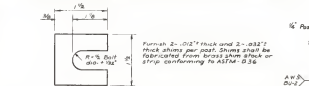
STEEL PIPE: Steel pipe shall conform to the requirements of A.S.T.M. A-53, Type E, Grade B, Schedule 40. Concrete shall be Class A or D with wood float finish on top. Form and 3/4" inches of foundation.

STRUCTURAL STEEL: For requirements governing structural steels and their fabrication, see Section 4.3 of the Standard Specifications. To avoid overlight these requirements shall be clearly noted on the shop drawings.

APPROVAL: Shop plans shall be approved by the State of Montana, Department of Highways before fabrication is begun.

PAVEMENT: The unit price bid per pound for steel posts shall be full payment for the steel posts and footings complete in place, including all concrete, reinforcing steel, welding, excavation, and all incidentals pertaining thereto. The weight of steel posts shall be computed by taking the length of post times the nominal weight per foot plus the weight of the break-away devices and stub shown in this table.

SIGNS: For sign placement and details see Signing Standard Drawings.
PAVEMENT: Shall be prepared to see ASTM D-155.
CONCRETE: Shall be prepared to see ASTM D-155.
STEEL: Shall be prepared to see ASTM A-53, Type E, Grade B, Schedule 40.
WELDING: Shall be prepared to see ASTM A-53, Type E, Grade B, Schedule 40.
PAVEMENT: Shall be prepared to see ASTM D-155.
CONCRETE: Shall be prepared to see ASTM D-155.
STEEL: Shall be prepared to see ASTM A-53, Type E, Grade B, Schedule 40.
WELDING: Shall be prepared to see ASTM A-53, Type E, Grade B, Schedule 40.



SHOP DETAIL

Note: Backing strip thickness for 1/2" max. Split shall be 1/2" up to half of post.

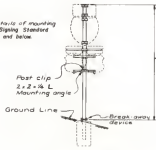
| | | |
|----------|----------|--------|
| DESIGNED | 10/15/78 | 4/1/79 |
| REVISOR | 2/1/78 | 4/1/79 |

APPROVED: [Signature]
SUPERVISOR - BRIDGE DIST.

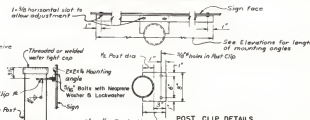
PROCEDURE FOR BASE CONNECTION ASSEMBLY

1. Assemble post to stub with bolts and one flat washer between plates.
2. Shim as required to plumb post.
3. Tighten bolts in a systematic order to the prescribed torque (See Table).
4. Loosen each bolt and retighten to prescribed torque in the same order as original tightening. DO NOT OVERTIGHTEN.
5. Bury threads of junction with nut and washer at center point to prevent nut loosening.

Note: For details of mounting angle see Signing Standard Drawing No. 225 and below.



TYPICAL SIGN ELEVATION



APPROVED BY: [Signature]
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 224

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
BREAK-AWAY B FOUNDATION DETAILS
FOR 3" & LARGER SINGLE PIPE SIGN POST

BRIDGE DRAWING NO. SN-1



Montana Department of Highways, Standard Specifications for Road and Bridge Construction, any amendments thereto, and Special Provisions shall govern unless otherwise noted.

Design conforms with A.A.S.H.T.O. Specifications for the Design and Construction of Structural Supports for Highway Signs.

Steel pipe shall conform to the requirements of A.S.T.M. A-53, Type E or S, Grade B.

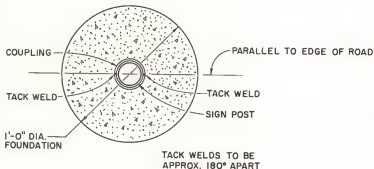
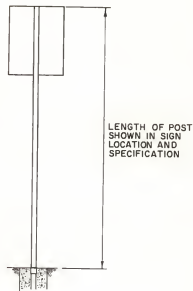
Concrete shall be Class A or D with wood float finish on top. Form top six (6) inches of foundation.

Galvanized pipe shall be galvanized as per A.S.T.M. A-123.

Pointed pipe shall receive one (1) shop coat and one (1) field coat of red lead paint or Basic Lead Silico-Chromate and one (1) field coat of aluminum paint, as specified in the Standard Specifications, on all surfaces not in contact with the concrete.

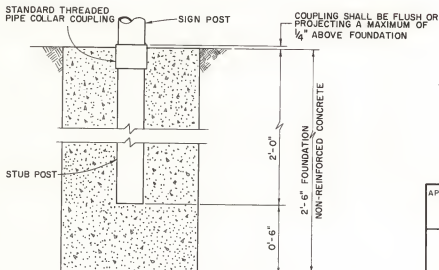
Shop drawings shall be approved by the Montana Department of Highways before fabrication is begun.

The unit price bid per pound for tubular steel posts shall be full payment for the steel posts and footings in place, including all concrete, welding, excavation, and all incidentals pertaining thereto. The weight of steel posts shall be computed by taking the length of post times the nominal weight per foot plus the weight of the breakaway device and stub shown in the table.



| Pipe size | Nominal weight per foot of pipe | Weight of each breakaway device and stub post |
|-----------|---------------------------------|---|
| 2" | 3.65 | 8.35 |
| 2½" | 5.79 | 13.67 |

For sign mounting detail see Signing Standard Drawing No. 226



| | |
|--------------------------------------|---------------|
| APPROVED | |
| BY: | <i>Robert</i> |
| ADMINISTRATOR - ENGINEERING DIVISION | |
| SIGNING | |
| STANDARD DRAWING NO. <u>225</u> | |
| STATE OF MONTANA | |
| DEPARTMENT OF HIGHWAYS | |
| 2" & 2½" Ø PIPE POST | |
| BREAKAWAY DETAIL | |

| | | | |
|-----------|--------|--|--|
| REVISED | 4/1/79 | | |
| EFFECTIVE | 6/1/79 | | |



2" Ø AND 2-1/2" Ø PIPE

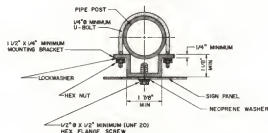


A SUITABLE WATERTIGHT CAP SHALL BE PLACED ON TOP OF ALL PIPE POSTS

2" AND 2 1/2" PIPE REQUIRE A BREAK-AWAY DEVICE AS PER SIGNING STANDARD DRAWING NO. 225

3" AND LARGER PIPE REQUIRE A BREAK-AWAY DEVICE PER SIGNING STANDARD DRAWING NO. 224

MATERIAL USED IN FABRICATION OF POST CLIPS AND ANGLE BRACKETS SHALL CONFORM TO SECTION 43 OF THE STANDARD SPECIFICATIONS.

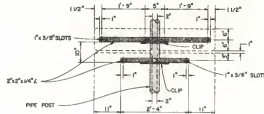


ALL MATERIAL USED IN FABRICATION OF THIS TYPE MOUNTING BRACKET SHALL BE CADMIUM PLATED OR GALVANIZED STEEL.

BACK-TO-BACK SIGN MOUNTING SHALL REQUIRE TWO BRACKETS WITH TWO 1/2" x 1/4" CARRIAGE BOLTS IN PLACE OF THE "U" BOLT.



TYPICAL MOUNTING DETAILS
FOR 3" Ø AND LARGER PIPE



THE LENGTH OF EACH L BRACKET SHALL DEPEND ON THE MOUNTING ASSEMBLY AND HOLE SPACING OF EACH SIGN. THE ASSEMBLIES SHOWN ARE TYPICAL INSTALLATIONS. ALL SIMILAR ASSEMBLIES SHALL BE ERRECTED IN A LIKE MANNER.

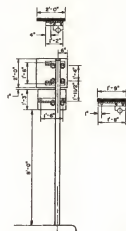
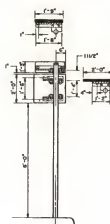
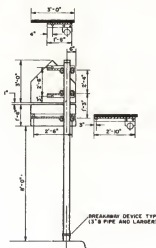
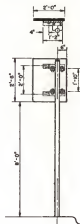
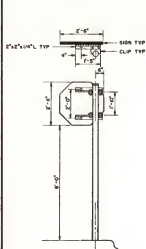
APPROVED
BY: *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 226

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
TYPICAL PIPE POST
MOUNTING DETAILS

| | | |
|-----------|----------|--------|
| REVISED | 10/11/76 | 4/1/79 |
| EFFECTIVE | 2/1/75 | 4/1/79 |

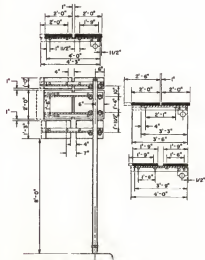




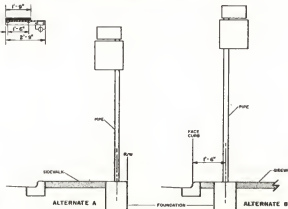
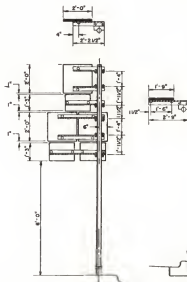
BREAKING DEVICE TYP
(1 1/2\"/>

NOTE:

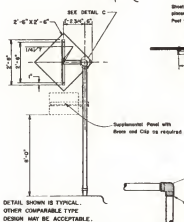
Post clips shall be furnished as detailed in
Signing Standard Drawing No. 224.
When off-set mounting is necessary, the
size of the post to be used shall be a size
larger than is required for a standard mounting.



Typical track bracing to be used with
24\"/>



The standard type mounting should be used behind sidewalks
if R/W limits permit. If R/W doesn't permit this, Alternate A
should be used behind sidewalks or in the sidewalk next to it.
If conditions are such that the sign cannot be mounted on the
backside of the sidewalk then Alternate B should be used.



DETAIL SHOWN IS TYPICAL.
OTHER COMPARABLE TYPE
DESIGN MAY BE ACCEPTABLE.



Supplemental Panel with
Screws and Clips as required



DETAIL C

| | | |
|-----------------------------------|--------------------------------------|--|
| APPROVED | BY: <i>[Signature]</i> | |
| | ADMINISTRATOR - ENGINEERING DIVISION | |
| SIGNING | | |
| STANDARD DRAWING NO. 227 | | |
| STATE OF MONTANA | | |
| DEPARTMENT OF HIGHWAYS | | |
| OFF-SET TYPE SIGN SUPPORT DETAILS | | |
| FOR SIDEWALK AREAS | | |

| | | |
|---------|--------|--------|
| REVISED | 6/1/74 | 4/1/75 |
| REVISED | 2/1/75 | 4/1/75 |

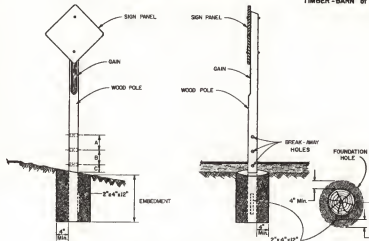


NOTES:

1. All Timber Poles shall conform to the 1976 State of Montana Department of Highways Standard Specifications.
2. All Timber Poles shall be full pressure treated as per the Standard Specifications.
3. All cutting, brining, and boring of Treated Poles shall conform and be in accordance with the Standard Specifications.
4. All Poles shall be galvanized on the sign side a minimum as shown in the Table below for 1/2 the length of each pole as shown.
5. Break Away Details shall be standard for all Timber Wood

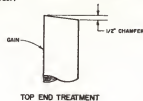
Poles listed in the Table below, either on single or multiple sign supports.

6. All Back Bracing material shall be of Standard No. 2 or better grade S 4 S lumber, and shall meet all spec's listed in Section M-320.01 of the Standard Specifications.
7. All bolts, nuts, and washers shall be of Aluminum, Stainless Steel, or Cadmium Plated Steel material.
8. A 2"x4"x12" board shall be attached 12" from the bottom of the Pole. Attachment shall be made by driving two nails (16d) through the 2"x4" and into the Pole. The 2"x4" shall be treated according to the Standard Specifications. The cost for all material and labor to accomplish this work shall be included in the Item - POLES - TREATED TIMBER - BARN of the contract.



BREAK-AWAY AND FOOTING DETAILS

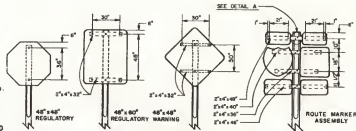
| POLE SIZE | A | B | C | POLE DIA. | EMBEDMENT | GAIN |
|-----------|----|----|--------|-----------|-----------|---------|
| 3" TOP Ø | — | — | — | 3" | 3'-0" | 3'-3/4" |
| 4" TOP Ø | — | — | — | 4" | 3'-0" | 3'-1/2" |
| 5" TOP Ø | 1" | 6" | 2" | 5" | 4'-6" | 4" |
| 6" TOP Ø | 1" | 6" | 2" | 6" | 5'-0" | 4" |
| CLASS A | 1" | 6" | 2-1/2" | 6" | 5'-0" | 4" |
| CLASS B | 1" | 6" | 2" | 6" | 5'-0" | 4" |
| CLASS C | 1" | 6" | 2" | 6" | 5'-0" | 4" |
| CLASS D | 1" | 6" | 2" | 6" | 5'-0" | 4" |



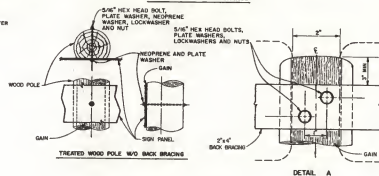
TOP END TREATMENT



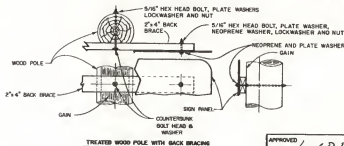
GAIN DETAIL



TYPICAL SIGN MOUNTINGS



DETAIL A



TREATED WOOD POLE WITH BACK BRACING

APPROVED
BY *L.D.R.*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 228

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
TREATED TIMBER POLE
SIGN SUPPORT DETAILS

REVISED 2/6/78 2/1/79
EFFECTIVE 2/1/79 2/1/79



R4-14



R4-14
36" x 36"
Margin = 3/8"
Border = 1/8"
Corner Radius = 2 1/4"
Black Legend and Border on a
Reflectorized White Background.

7"
4" SERIES "D"
3"
4" SERIES "D"
3"
4" SERIES "D"
7"

R10-9a



R10-9a
24" x 30"
Margin = 3/8"
Border = 3/8"
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.

3"
3" SERIES "D"
2 1/4"
3" SERIES "D"
2 1/4"
3" SERIES "D"
2 1/4"
3" SERIES "D"
2 1/4"
3" SERIES "D"
3"

1 1/4"
2" SERIES "D"

R10-11



R10-11
24" x 30"
Margin = 3/8"
Border = 3/8"
Corner Radius = 1 1/2"
Black Legend and Border on a Reflectorized White
upper portion, and a Reflectorized White Legend on
a Black Background lower portion.

3 1/2"
4" SERIES "D"
2"
4" SERIES "D"
2"
4" SERIES "D"
2"
4" SERIES "D"
2 1/4"

R12-5



R12-5
24" x 30"
Margin = 3/8"
Border = 3/8"
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.

3"
3" SERIES "D"
3"
3"
3" SERIES "D"
2 1/2"
3" SERIES "D"
2 1/2"
3" SERIES "D"
3"

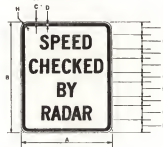
R13-2



R13-2
60" x 60"
Margin = 1/2"
Border = 1"
Corner Radius = 3"
Black Legend and Border on a
Reflectorized White Background.

3"
6" SERIES "H"
3"
6" SERIES "H"
3"
4" SERIES "D"
3"
4" SERIES "D"
3"
4" SERIES "D"
3"
4" SERIES "D"
3"
4" SERIES "D"

R2-11



R2-11 DIMENSIONS

| A | B | C | D | E | F | G | H |
|-----|-----|--------|--------|--------|--------|--------|--------|
| 24" | 30" | 3 1/8" | 3 1/8" | 3 1/8" | 4 1/2" | 2 1/2" | 1 1/2" |
| 60" | 60" | 1 1/4" | 1 1/4" | 1 1/4" | 3" | 3" | 3" |

Black Legend and Border on a
Reflectorized White Background.

R12-5 P



R12-5 P
15" x 15"
Margin = 3/8"
Border = 3/8"
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.

2 3/8"
3" SERIES "D" (Specify No.)
2 1/4"
3" SERIES "D"
2 3/8"

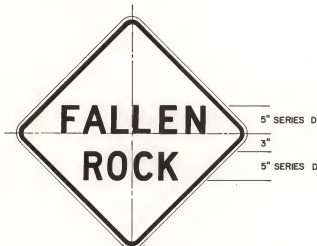
APPROVED
BY: *John P. Barber*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 232

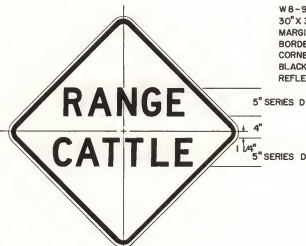
STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
SPECIAL DESIGN REGULATORY SIGNS

DESIGNED: *MS/MS*
REFLECTIVE: *71/125*

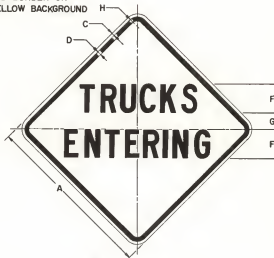




W8-9
30" X 30"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND



W11-7
30" X 30"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND



W11-B
SEE DIMENSIONS BELOW
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND

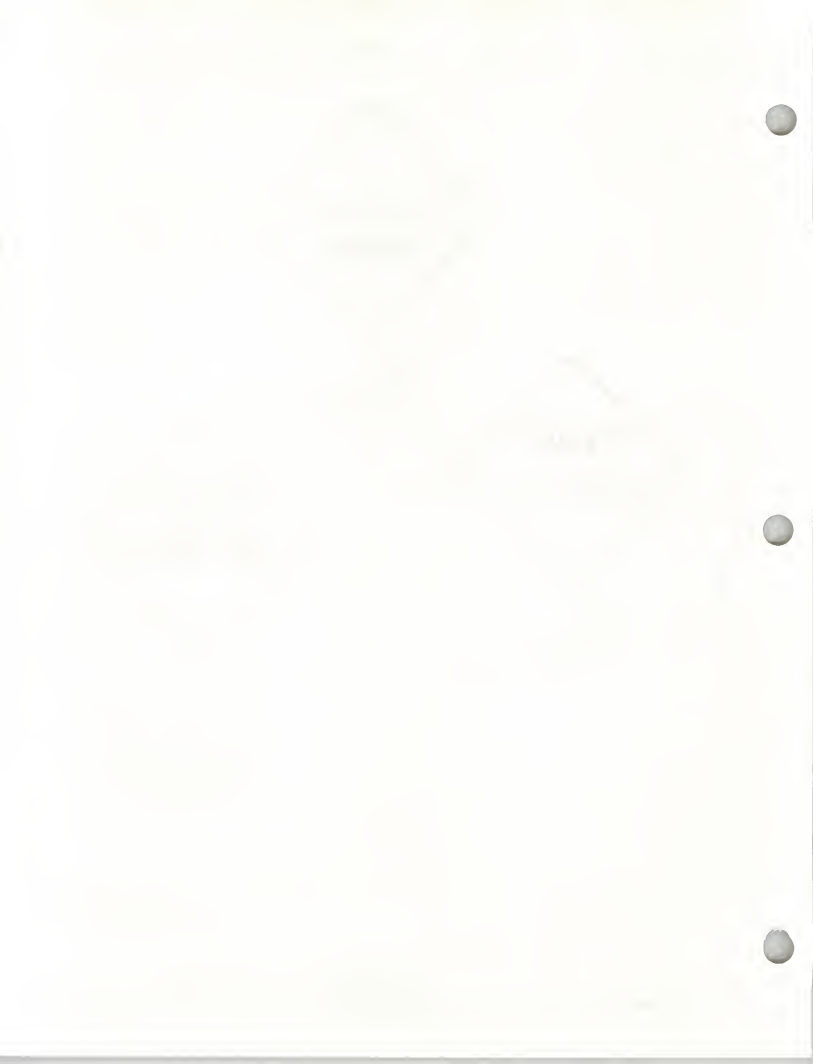
| A | C | D | F | G | H |
|-----|--------|--------|------|--------|--------|
| 30" | 1 1/2" | 3/4" | 5" C | 3" | 7/8" |
| 36" | 5/8" | 7/8" | 6" C | 3 1/2" | 1 1/4" |
| 48" | 3/4" | 1 1/4" | 8" C | 5" | 3" |

SIGNING STANDARD
DRAWING NUMBER 233

WARNING SIGNS
SPECIAL DESIGN

REVISED 4/1/79
EFFECTIVE 6/1/79

APPROVED
BY *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION



PANELS

FOR ROUTE MARKER ASSEMBLY USE

M1-6 PRIMARY



M1-6
24" x 24"
Margin = None
Border = 1 1/2"
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.



M1-6
30" x 24"
Margin = None
Border = 1 1/2"
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.

M1-8 SECONDARY



M1-8
24" x 24"
Margin = None
Border = See design above.
Corner Radius = 1 1/2"
Black Legend and Border on a
Reflectorized White Background.

SHIELDS

FOR USE ON GUIDE SIGNS

PRIMARY

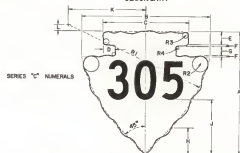


SERIES "U" NUMERALS

| 10" NUM. | 12" NUM. | 18" NUM. | 24" NUM. | 36" NUM. |
|----------|----------|----------|----------|----------|
| 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 |
| 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 |
| 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 |
| 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 |
| 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 |
| 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 |
| 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 |
| 96 | 97 | 98 | 99 | 100 |

Black Legend on a Reflectorized
White Background with no Border.

SECONDARY



SERIES "U" NUMERALS

| NUMERICAL SIZE | RADIUS | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|--------|-----|---------|--------|--------|--------|--------|--------|--------|---------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 8" 1/2 | 26" | 28" | 38 1/2" | 2 5/8" | 3" | 5/16" | 2 1/2" | 1 1/4" | 1 1/2" | 1 3/4" | 3 1/4" | 3 3/4" | 3 1/2" | 3 1/4" | 3 1/2" | 3 1/4" | 3 1/2" | 3 1/4" | 3 1/2" | 3 1/4" | 3 1/2" | 3 1/4" | 3 1/2" | 3 1/4" | 3 1/2" |
| 10" 1/2 | 32" | 34" | 22 1/2" | 3 1/4" | 5 5/8" | 3/4" | 2 1/2" | 6 3/4" | 3 3/4" | 20 1/2" | 2" | 38 1/2" | 2" | 3 1/2" | | | | | | | | | | | |
| 12" 1/2 | 40" | 42" | 28" | 4" | 4 1/2" | 1 1/2" | 3" | 8 3/8" | 1 3/4" | 2 1/2" | 7 1/8" | 4 1/2" | 2 1/2" | 4 1/2" | | | | | | | | | | | |

Black Legend on a Reflectorized White Background.

* To be used with standard 24" U.S. Shield.

** To be used with standard 30" U.S. Shield.

*** To be used with standard 42" U.S. Shield & all independent use.

| REVISED | 10/27/74 |
|-----------|----------|
| EFFECTIVE | 2/1/75 |

NOTE:

All numerals used on Panels
and Shields shall be optically
centered about vertical centerline.

APPROVED
BY *Jack R. Dwyer*
ADMINISTRATOR - ENGINEERING DIVISION
SIGNING
STANDARD DRAWING NO. 234

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
SPECIAL DESIGN PRIMARY &
SECONDARY ROUTE MARKER
PANELS AND SHIELDS





10" UPPER CASE
10" UPPER CASE
10" UPPER CASE

D9-11
12'-0" X 8'-0"



12" UPPER CASE
12" NUMERAL
12" UPPER CASE

D9-11
12'-0" X 8'-0"



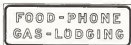
10" UPPER CASE
10" UPPER CASE
10" UPPER CASE
10" UPPER CASE
10" UPPER CASE

D9-14
12'-0" X 8'-0"



12" UPPER CASE
12" UPPER CASE
12" NUMERAL
10" UPPER CASE

D8-1
8'-0" X 6'-0"



10" UPPER CASE
10" UPPER CASE

D9-12
12'-0" X 4'-0"



12" UPPER CASE
12" UPPER CASE

D9-12
12'-0" X 6'-0"



10" UPPER CASE
10" UPPER CASE
10" UPPER CASE
10" UPPER CASE

D9-15
12'-0" X 7'-0"



10" UPPER CASE
10" UPPER CASE
10" UPPER CASE



10" UPPER CASE

D8-2
12'-0" X 6'-0"



10" UPPER CASE
10" UPPER CASE
14 1/4" X 17 1/4" AT 45°
ARROW

D8-3
8'-0" X 6'-0"



10" UPPER CASE

D9-13
12'-0" X 2'-0"



12" UPPER CASE
12" UPPER CASE

21 7/8" X 23" AT 45°
ARROW

D9-13
6'-6" X 6'-6"



6" UPPER CASE

D9-17
7'-0" X 1'-6"



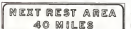
15 1/2" UPPER CASE
10" LOWER CASE
10" LOWER CASE
13 1/2" UPPER CASE
10" LOWER CASE

N6-4b
9'-6" X 7'-0"



10" UPPER CASE
10" UPPER CASE
10" UPPER CASE
10" UPPER CASE

R10-1
11'-0" X 7'-0"



8" UPPER CASE
8" UPPER CASE AND NUMERAL

D9-14
11'-6" X 5'-0"



8" UPPER CASE
8" UPPER CASE AND NUMERAL

D9-18
10'-0" X 8'-0"

NOTES:

1. ALL SIGNS SHOWN SHALL HAVE SERIES E MODIFIED REFLECTORIZED WHITE LEGEND.

2. SIGNS D8-11 THRU D8-14 SHALL HAVE TYPE B OR C LETTERS ON REFLECTORIZED BLUE BACKGROUND EXCEPT D8-14 SHALL HAVE TYPE B REMOVABLE NUMBERS.

3. SIGNS D8-1 THRU D8-3 AND N6-4b SHALL HAVE TYPE B OR C LETTERS ON A REFLECTORIZED GREEN BACKGROUND.

4. SIGNS D8-5 THRU D9-17 SHALL HAVE TYPE B REMOVABLE LETTERS AND NUMBERS ON A REFLECTORIZED BLUE BACKGROUND EXCEPT D9-17 MAY USE TYPE C LETTERS.

5. SIGN R10-1 SHALL HAVE TYPE B OR C LETTERS ON A NON-REFLECTORIZED BLACK BACKGROUND.

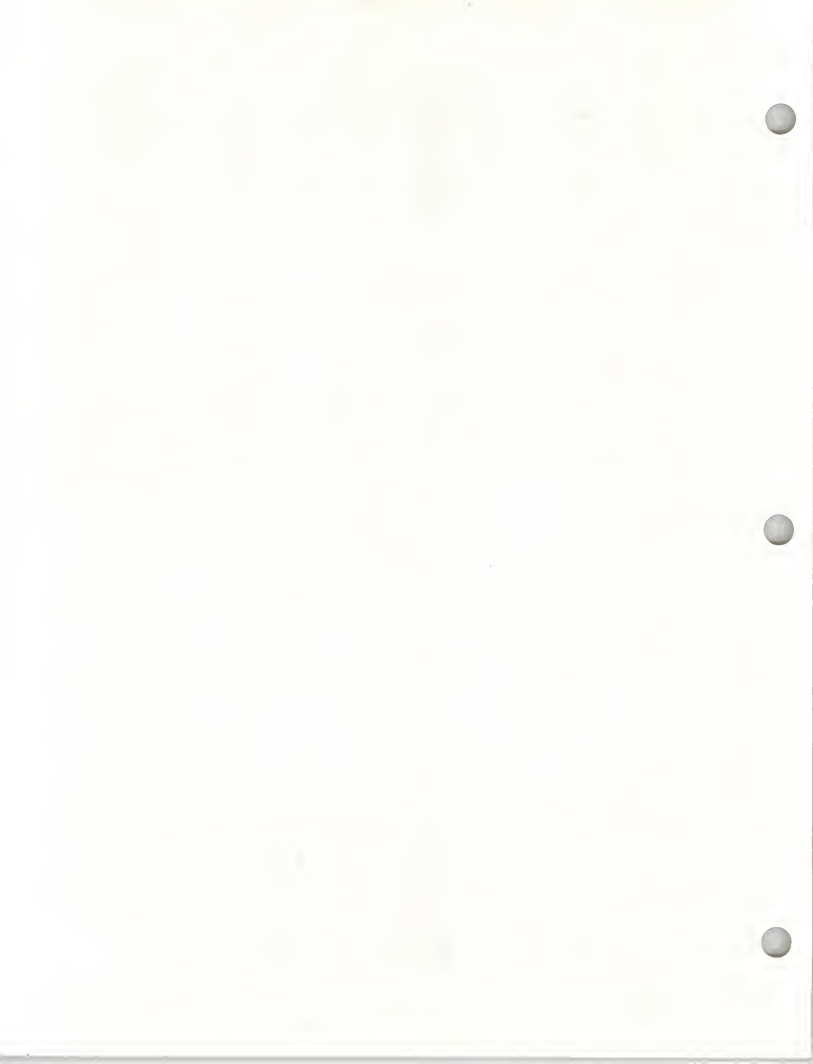
6. SHOP DRAWINGS SHALL BE SUBMITTED PER THE FOLLOWING SPECIAL PROVISIONS.

| REVISED | BY | DATE |
|---------|--------|------|
| 23/1/79 | 2/1/79 | |
| 2/1/79 | 2/1/79 | |

APPROVED
BY: *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 235

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
LAYOUT DETAILS FOR STANDARD
INFORMATION SIGNS ON
INTERSTATE HIGHWAYS





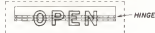
D8-1a



D8-2a



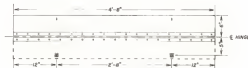
D8-2aP



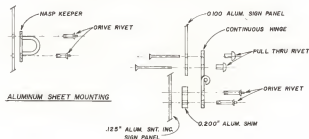
NOTES:

1. D8-1a & D8-2a Signs shall have WHITE REFLECTORIZED legend on a GREEN REFLECTORIZED background
2. D8-2a Sign shall have WHITE REFLECTORIZED legend on a NonreflectORIZED BLACK background
3. The sign panel shall be 3/4" HIGH DENSITY PLYWOOD or .125" ALUMINUM SHEET INCREMENT. The hinged panel shall be 0.100" SHEET ALUMINUM
4. All hardware visible on the sign face shall be painted the same color as the sign.
5. Shop drawings shall be submitted and approved prior to fabrication.
6. D8-1a may have variable distance legend
7. All legend shall have SERIES "C" MODIFIED letters
8. Open-Closed sign panel below D8-2a shall have WHITE REFLECTORIZED legend on a BLACK background (D8-2aP)
9. The mounting height to the bottom of the SECONDARY PANEL (D8-2aP) shall be 4'-0"

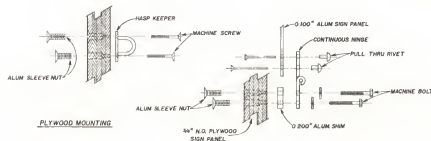
R 13-1a



HINGE DETAIL



ALUMINUM SHEET MOUNTING



PLYWOOD MOUNTING

APPROVED
BY *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 237

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
WEIGH STATION SIGN DESIGN
DETAILS FOR PRIMARY HIGHWAYS

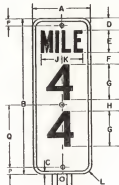
REVISED 5/5/76
EFFECTIVE 2/1/75



DIO-1
&
DIO-4



DIO-2
&
DIO-5

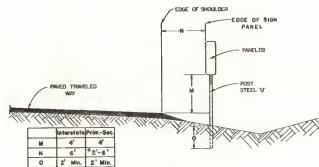


DIO-3
&
DIO-6



SINGLE PANEL

DOUBLE PANEL



TYPICAL MILEPOST PLACEMENT

POOL PRIMARY
S201 SECONDARY
1015 INTERSTATE



NOTES:

1. IN CASE OF A NEW SIGNING PROJECT THE CONTRACTOR SHALL PLACE ROUTE NUMBER IDENTIFICATION STICKERS UPON ALL SIGNS BEFORE FINAL ACCEPTANCE OF THE PROJECT THE COST FOR THE LABOR TO ACCOMPLISH THIS WORK SHALL BE INCLUDED IN THE SHEET ALUMINUM OR ALUMINUM SHEET IDENTIFICATION ITEMS OF THE CONTRACT

2. THE STICKER SHALL DISPLAY THE FEDERAL AND ROUTE NUMBER SHALL BE PLACED IN THE LOWER LEFT CORNER OF THE MILEPOST SIGN NEAREST THE EDGE OF ROADWAY

3. THE STICKERS SHALL BE AVAILABLE IN THE DIVISION MAINTENANCE OFFICES THE STICKERS ARE MADE AND CAN BE ORDERED FROM THE DEPARTMENT SIGN SHOP IN HELENA.

MILEPOST PANEL DIMENSION INFORMATION

| KEY | DIO-4 | DIO-5 | DIO-6 |
|-----|-------|-------|-------|
| A | 20.0 | 20.0 | 20.0 |
| B | 24.0 | 36.0 | 48.0 |
| C | 0.5 | 0.5 | 0.5 |
| D | 3.0 | 3.0 | 3.0 |
| E | 4.0 | 4.0 | 4.0 |
| F | 3.0 | 3.0 | 3.0 |
| G | 10.0 | 10.0 | 10.0 |
| H | 3.0 | 2.5 | 3.0 |
| J | 4.6 | 4.6 | 4.6 |
| K | 4.8 | 4.8 | 4.8 |
| L | 1.5R | 1.5R | 1.5R |
| P | 2.0 | 2.0 | 2.0 |
| Q | - | 13.0 | 12.0 |
| R | - | - | 13.0 |

* DIGITS SHOULD BE OPTICALLY CENTERED ON VERTICAL & OF MILEPOST PANEL. ABOVE VALUES ARE IN INCHES.

NOTES

1. MILEPOST PANEL SHALL HAVE A REFLECTORIZED WHITE LEGEND AND BORDER ON REFLECTORIZED GREEN BACKGROUND.

2. ALL MILEPOSTS SHALL BE MOUNTED ON A 3 LB./FT. MINIMUM STEEL V POST EXCEPT THE DIO-6 SHALL BE MOUNTED ON A 3 LB./FT. MINIMUM STEEL V POST, AS NOTED IN THE SIGNING PLANS.

3. 5/8" BOLT, NUT AND WASHER SHALL BE GALVANIZED OR CADMIUM PLATED THREADS SHALL BE GALVANIZED OR CADMIUM PLATED. RIVETS SHALL BE 5/8" ALUMINUM OR CADMIUM PLATED. BOLT OR RIVET HEADS SHALL BE PAINTED WITH BRILLIANT GREEN SIGN ENAMEL.

4. A MILEPOST SHALL NOT BE RELOCATED OR MOVED UNCE IT HAS BEEN PROPERLY PLACED.

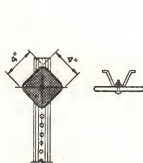
| KEY | DIO-1 | DIO-2 | DIO-3 |
|-----|-------|-------|-------|
| A | 10.0 | 10.0 | 10.0 |
| B | 18.0 | 27.0 | 36.0 |
| C | 0.5 | 0.5 | 0.5 |
| D | 2.0 | 2.0 | 2.0 |
| E | 4.8 | 4.8 | 4.8 |
| F | 2.0 | 2.0 | 2.0 |
| G | 6.0 | 6.0 | 6.0 |
| H | 3.0 | 3.0 | 3.0 |
| J | 3.6 | 3.6 | 3.6 |
| K | 3.8 | 3.8 | 3.8 |
| L | 1.5R | 1.5R | 1.5R |
| P | 1.5 | 1.5 | 1.5 |
| Q | - | 10.0 | 10.0 |
| R | - | - | 9.0 |

REVISED 10/6/78
EFFECTIVE 2/1/79

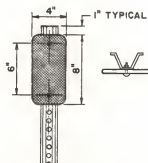
APPROVED BY: *Jack P. Bell*
ADMINISTRATOR - ENGINEERING DIVISION
SIGNING
STANDARD DRAWING NO. 241

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
MILEPOST DETAILS

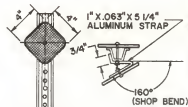




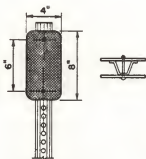
DESIGN A (WHITE)
DESIGN H (YELLOW)



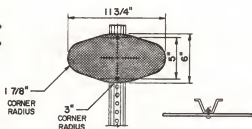
DESIGN B (YELLOW)
DESIGN G (WHITE)



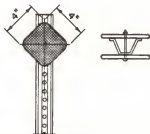
DESIGN C (WHITE)



DESIGN D (YELLOW)



DESIGN E (YELLOW)



DESIGN F (WHITE)

TABLE II

| DELINEATOR | LEGEND |
|------------|---------|
| DESIGN "A" | — |
| DESIGN "B" | — |
| DESIGN "C" | —V— |
| DESIGN "D" | — — |
| DESIGN "E" | — — — |
| DESIGN "F" | —V— |
| DESIGN "G" | —V— |
| DESIGN "H" | —> |

SIGNING STANDARD
DRAWING NUMBER 242

DELINEATOR DESIGN
AND LEGEND

REVISED 4/1/79
EFFECTIVE 6/1/79

APPROVED
BY *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION



NOTES

1. REFLECTIVE SHEETING SHALL BE FURNISHED ACCORDING TO STANDARD SPECIFICATIONS FOR ENCAPSULATED LENS WIDE ANGLE. POSITION DELINEATOR FACES PERPENDICULAR TO TANGENT TO CENTER LINE OF CURVE AS SHOWN IN FIGURE B.

2. DELINEATORS SHALL BE MOUNTED ON METAL U POSTS WITH 3/16" CADIUM PLATED BOLT(S). A MINIMUM OF 12 1/4" DIAMETER HOLES SHALL BE DRILLED OR PUNCHED ON 1" CENTERS FROM THE TOP OF THE POST. 1/4" SQUARE HOLES MAY BE USED. IF SQUARE HOLES ARE USED A LARGE HEADED BOLT OR AN APPROPRIATE WASHER MUST BE USED. THREADS SHALL BE JAMMED AFTER TIGHTENING THE NUT TO PREVENT REMOVAL.

3. DELINEATORS SHALL BE PLACED AT A CONSTANT CLEARANCE FROM THE EDGE OF PAVEMENT EXCEPT WHERE GUARDRAIL OR OTHER OBSTRUCTION INTERFERES. DELINEATORS SHALL THEN BE IN LINE WITH THE INSIDE EDGE OF THE OBSTRUCTION. CLEARANCE FOR DELINEATORS SHALL BE 6'-0" ON INTERSTATE HIGHWAYS, 2'-0" TO 6'-0" ON PRIMARY AND SECONDARY HIGHWAYS AS DETERMINED BY THE PROJECT ENGINEER. STANDARD MOUNTING HEIGHT SHALL BE 4'-0". POST LENGTHS SHALL BE SUPPLIED TO MAINTAIN THE PROPER MOUNTING HEIGHT AND A MINIMUM OF 18" EMBEDMENT.

4. DELINEATORS SHALL BE SPACED ACCORDING TO THE DISTANCES FOUND IN TABLE I. DELINEATORS THAT ARE TO BE SPACED DIFFERENTLY WILL BE NOTED IN THE PLANS AS TO THEIR PLACEMENT. IN FIGURE A IF "E" DISTANCE IS GREATER THAN 20' ADD ONE REGULAR DELINEATOR IN AT "A" SPACING. UNDER NORMAL SPACING, SHOULD A DELINEATOR FALL WITHIN A CROSSROAD OR APPROACH, IT MAY BE MOVED IN EITHER DIRECTION A DISTANCE NOT TO EXCEED ONE QUARTER OF THE NORMAL SPACING. DELINEATORS STILL FALLING WITHIN SUCH AREAS SHALL BE ELIMINATED.

5. FIGURE C IS A FIELD METHOD FOR DETERMINING DEGREE OF HORIZONTAL CURVES.

6. ALL DELINEATOR REFLECTORS SHALL HAVE 3/4" CORNER RADII EXCEPT DESIGN "E".

7. THE DELINEATOR REFLECTOR SHALL BE MOUNTED 1" BELOW THE TOP OF THE METAL U POST.



FIGURE A
SEE TABLE I FOR SPACING VALUES

TABLE I

| DEGREE OF CURVE | HORIZONTAL CURVE SPACING TABLE | | SPACING ON BOTH APPROACH TANGENTS | | | |
|-----------------|--------------------------------|------|-----------------------------------|------|------|------|
| | SPACING ON CURVE | A | B | C | D | E |
| 0° TO 30' | 300' | 400' | 400' | 400' | 400' | 400' |
| 30' TO 1° | 300' | 400' | 400' | 400' | 400' | 400' |
| 1° TO 2° | 225' | 400' | 400' | 400' | 400' | 400' |
| 2° TO 3° | 160' | 320' | 400' | 400' | 400' | 400' |
| 3° TO 4° | 130' | 260' | 400' | 400' | 400' | 400' |
| 4° TO 6° | 110' | 220' | 330' | 400' | 400' | 400' |
| 6° TO 8° | 90' | 185' | 275' | 400' | 400' | 400' |
| 8° TO 12° | 75' | 150' | 230' | 300' | 400' | 400' |
| 12° TO 20° | 60' | 125' | 185' | 300' | 400' | 400' |
| 20° PLUS | 45' | 90' | 140' | 275' | 400' | 400' |



FIGURE B

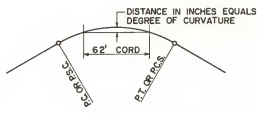


FIGURE C

SIGNING STANDARD
DRAWING NUMBER 243

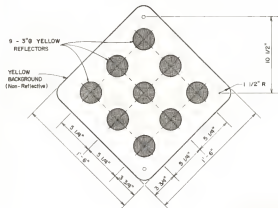
DELINEATOR PLACEMENT
DETAILS AND NOTES

REVISED 4/1/79
EFFECTIVE 6/1/79

APPROVED BY: *[Signature]*
ADMINISTRATOR-ENGINEERING DIVISION



TYPE 1 X3-2

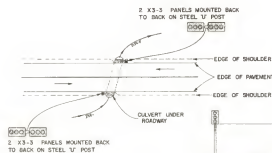
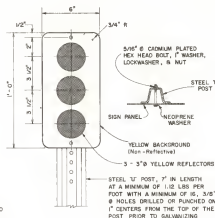


ALTERNATE DESIGNS FOR TYPE 1 AND TYPE 2 OBJECT MARKERS ARE ALL YELLOW REFLECTORIZED PANELS OF THE SAME SIZE



TYPICAL USE AND PLACEMENT

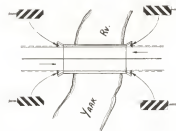
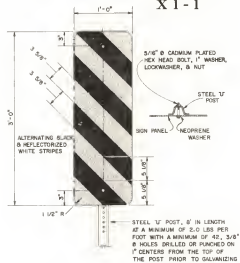
TYPE 2 X3-3



TYPICAL USE AND PLACEMENT

POST AND PANEL(S) TO BE PLACED SO THAT PANEL(S) ARE DIRECTLY ADJACENT TO INNER MOST EDGE OF OBJECT NEAREST TRAVELED WAY.

TYPE 3 X1-1



TYPICAL USE AND PLACEMENT



* POST AND PANEL TO BE PLACED SO THAT PANEL EDGE IS FLUSH WITH EDGE OF OBJECT NEAREST TRAVELED WAY.

APPROVED BY *Richard P. Smith*
ADMINISTRATOR ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 244

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
OBJECT MARKER DESIGN &
PLACEMENT DETAILS FOR OBSTRUCTIONS
ADJACENT TO OR WITHIN HIGHWAYS

REVISED 4/5/87
EFFECTIVE 2/1/72



5" Ø MINIMUM - 6" Ø MAXIMUM

2'-6"

1'-0"

8'-4"

REFLECTORIZED WHITE PAINT
(IF SPECIFIED)

DELINEATOR CRYSTAL
(IF SPECIFIED)

WHITE PAINT

8" Ø HOLE

1 1/2" MINIMUM - 1 3/4" MAXIMUM

4"

1 1/2"

1/2"

1/2"

2"

7 1/2"

REFLECTORIZED WHITE PAINT (IF SPECIFIED)

DELINTEATOR CRYSTAL (IF SPECIFIED)

WHITE PAINT

2" Ø HOLE

[illegible]

1. WOOD GUIDE POSTS SHALL CONFORM TO THE APPLICABLE PROVISIONS OF THE STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION.
2. THE PORTION OF THE WOOD GUIDE POST THAT IS TO BE IN THE GROUND SHALL BE TREATED FOR PROTECTION AS PER THE STANDARD SPECIFICATIONS.
3. THE PORTION OF THE WOOD GUIDE POST THAT IS TO BE ABOVE GROUND SHALL BE PAINTED WITH TWO (2) COATS OF WHITE PRIME AS PER THE STANDARD SPECIFICATIONS.
4. CONTRACTOR HAS CHOICE OF TOP END FINISH FOR WOOD GUIDE POSTS. ALL WOOD GUIDE POSTS FURNISHED ON CONTRACT SHALL HAVE THE SAME TOP END FINISH THROUGHOUT.
5. REFLECTORIZATION OF WOOD GUIDE POSTS, IF REQUIRED IN PLAN SPECIFICATIONS, SHALL BE ACCOMPLISHED BY

1. FLEXIBLE GUIDE POSTS SHALL CONFORM TO THE DESIGN AND SPECIFICATIONS DETAILED ON THIS SHEET.
2. FLEXIBLE GUIDE POSTS SHALL BE EMBEDDED TO THE MANUFACTURERS' SPECIFIED FOUNDATION DEPTH WITH THEIR SPECIFIED FOUNDATION WIDTH USING THE POST ANCHORING DESIGN AS DETAILED.
3. THE HOLLOW POST PORTION TO BE IN THE GROUND SHALL BE BACKFILLED INSIDE WITH THE SAME MATERIAL AS THE

Diagram illustrating the dimensions and components of a raised or painted median:

- 2'-0" MINIMUM TO 3'-0" MAXIMUM FROM NOSE OF RAISED OR PAINTED MEDIAN (UNLESS OTHERWISE SPECIFIED)
- CURB FACE OR EDGE OF PAINT
- GUIDE POST
- RAISED OR PAINTED MEDIAN

[illegible]

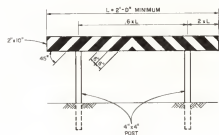
• DIRECTION OF VEHICULAR TRAVEL

| | | |
|-----------|----------|--|
| REVISED | 10/16/74 | |
| EFFECTIVE | 2/1/75 | |

SIGNING
STANDARD DRAWING NO. 245

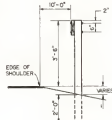
STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
GUIDE POST DESIGN AND
PLACEMENT DETAILS

B (I) BARRICADE

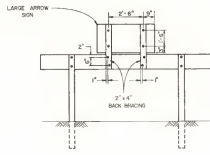


FRONT VIEW
B.I.

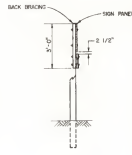
GENERAL BARRICADE DETAILS



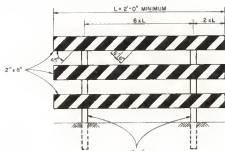
RIGHT
SIDE VIEW



REAR VIEW

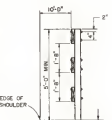


LEFT
SIDE VIEW

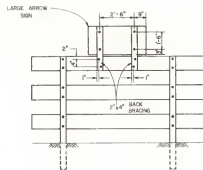


FRONT VIEW
B.III

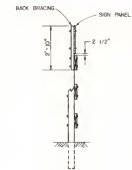
GENERAL BARRICADE DETAILS



RIGHT
SIDE VIEW



REAR VIEW



LEFT
SIDE VIEW

SIGN MOUNTING DETAILS

NOTES

1 ALL BARRICADES SHALL BE CONSTRUCTED OF COMMERCIAL GRADE S4S LAMBER. USE $\frac{3}{8}$ " CARRIAGE OR COLD-CHAMFERED BOLTS, WASHERS, AND NUTS FOR ALL CONNECTIONS.

2 ALL BARRICADES SHALL BE PAINTED WITH TWO COATS OF WHITE PAINT IN ACCORDANCE WITH SECTION M-205.02, M-205.03, AND M-205.04 OF THE STANDARD SPECIFICATIONS MANUAL, STATE OF MONTANA - DEPARTMENT OF HIGHWAYS.

3 ALL BARRICADES SHALL HAVE ALTERNATING REFLECTIVE RED AND WHITE STRIPES, 6" IN WIDTH AT AN ANGLE OF 45° WITH THE VERTICAL, SLANTING DOWNWARD TOWARD THE SIDE OR SIDES ON WHICH TRAFFIC IS TO FLOW. NOMINAL DIMENSIONS OF ROLL MATERIAL FOR STRIPES IS ACCEPTABLE.

4 ALL BARRICADES SHALL BE REFLECTORIZED WITH THE SHEETING MOUNTED ON A SHEET ALUMINUM BACKING AT LEAST 0.010" THICK ALUMINUM ALLOY 6061-T6 CONFORMING TO A.S.T.M. DESIGNATION B-209 SHALL BE USED. THIS REFLECTIVE ALUMINUM SHEETING SHALL BE SECURED WITH ALUMINUM NAILS.

5 POST LENGTHS SHALL BE DETERMINED IN THE FIELD, TO COMPLY WITH THE MOUNTING HEIGHTS AND FOUNDATION DEPTHS LISTED ON THIS SHEET.

6 MOVABLE BARRICADES SHALL BE CONSTRUCTED PER CONSTRUCTION STANDARD DRAWING NUMBER 210.

7 ALL POSTS NECESSARY TO CONSTRUCT AND INSTALL BARRICADES SHALL BE INCLUDED IN THE ITEM "BARRICADE TYPE, L.N. FT."

8 BARRICADES DESIGNATED "A" SHALL BE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC.

B III BARRICADE

| | | |
|-----------|--------|--------|
| REVISED | 4/1/79 | 4/1/79 |
| EFFECTIVE | 2/1/79 | 4/1/79 |

APPROVED
BY *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 246

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
PERMANENT BARRICADE
DESIGN DETAILS





3"
6" UPPER CASE SERIES D
2"
4" UPPER CASE SERIES B
3"

S2-IS
36" X 16"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED WHITE BACKGROUND



6" NUMERAL SERIES E
6" UPPER CASE SERIES C

SI-IS
36" X 12"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND

NOTES

1. INFORMATION CONTAINED HEREIN IS NOT THE LEGAL AUTHORITY FOR PLACEMENT OF SCHOOL CROSSING CONTROL DEVICES. THE DECISION TO USE SUCH CONTROL DEVICES SHOULD BE MADE ON THE BASIS OF A TRAFFIC ENGINEERING INVESTIGATION.
2. THE S2-IS PANEL IS TO SUPPLEMENT THE S2-1 SIGN. THE SI-IS PANELS ARE TO SUPPLEMENT THE SI-1 SIGN.

VARIABLE



6" NUMERAL SERIES C
8" X SERIES C
6" UPPER CASE SERIES C

SI-IS
36" X 12"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND

VARIABLE



6" NUMERAL AND
6" UPPER CASE
SERIES D

SI-IS
36" X 12"
MARGIN = 1/2"
BORDER = 3/4"
CORNER RADIUS = 1 7/8"
BLACK LEGEND AND BORDER ON
REFLECTORIZED YELLOW BACKGROUND

SIGNING STANDARD
DRAWING NUMBER 251

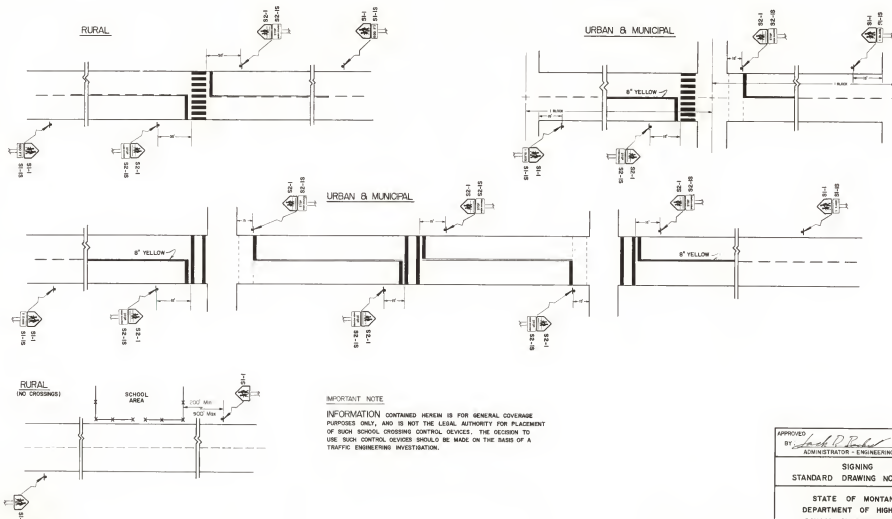
SCHOOL CROSSING SERIES-
SUPPLEMENTAL SIGN
DESIGN DETAILS

| | |
|-----------|--------|
| REVISED | 4/1/79 |
| EFFECTIVE | 6/1/79 |

| | |
|----------|------------------------------------|
| APPROVED | |
| BY | ADMINISTRATOR-ENGINEERING DIVISION |



PLACEMENT GUIDELINES



IMPORTANT NOTE

INFORMATION CONTAINED HEREIN IS FOR GENERAL COVERAGE PURPOSES ONLY, AND IS NOT THE LEGAL AUTHORITY FOR PLACEMENT OF HIGH SCHOOL CROSSING CONTROL DEVICES. THE DECISION TO USE SUCH CONTROL DEVICES SHOULD BE MADE ON THE BASIS OF A TRAFFIC ENGINEERING INVESTIGATION.

DRAWN BY 5-30-73 G E G
CHECKED BY 5-30-73 C F L

REVISED 10/7/76 4/1/79
EFFECTIVE 2/1/79 6/1/79

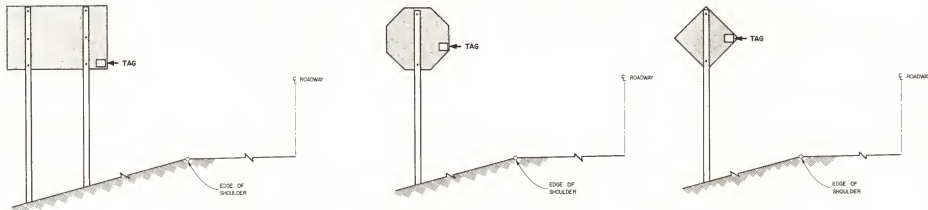
APPROVED BY *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 252

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
SCHOOL CROSSING SERIES
SIGNING & PLACEMENT DETAILS



— INSTALLATION DATE TAGS — PLACEMENT DETAILS



NOTES:

1. In the case of a new Signing Project, the contractor shall place Installation Date Tags upon all signs before final acceptance of the Project. The cost for the labor to accomplish this work shall be included in the Sheet Aluminum and/or Aluminum Sheet Increment items of the Contract. Tags are supplied by the state.
2. Tags shall also be placed upon any new sign which is installed in the field as routine maintenance.
3. The Tag shall display the year in which the sign was installed. The color for each years Tag shall be assigned at the beginning of the year by the Department of Highways Sign Shop in Helena, in order to make it easier to recognize the year of installation from the roadway.
4. The Tag shall be placed upon the back of each sign, located near the lower corner of the sign inboard the edge of roadway, and shall be visible from the roadway as shown in the examples (tag) above.
5. The Tags shall be available in the Divisions, either of the Division Maintenance Office or the Division Construction Office. The Tags are made and can be ordered from the Department Sign Shop in Helena.

DRAWN BY: 3-30-75 S. E. R.
CHECKED BY: 3-30-75 G. A. J.

REVISED 10/14/76
EFFECTIVE 2/1/75

APPROVED BY: *[Signature]*
ADMINISTRATOR - ENGINEERING DIVISION

SIGNING
STANDARD DRAWING NO. 256

STATE OF MONTANA
DEPARTMENT OF HIGHWAYS
INSTALLATION DATE TAGS
PLACEMENT DETAILS





